

THE LEGACY OF ARABIC MEDICINE DURING THE GOLDEN AGE OF ISLAM

By

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Forward by:

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DAVID LIONEL WRIGHT

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Dedicated to Henry Joseph Keen, a true friend

In gratitude....

It was curiosity which started me on a quest for answers to questions such as, "Was Avicenna an Italian?," ignorance of the answers which sustained my reading and a growing realisation of just how important Arabic Medicine had been to the [ungrateful] West which stimulated me to actually write something about the subject.

A host of people allowed me to acquire the little knowledge I now possess on the matter of Arabic Medicine. I feel I must name but a few and beg those I have left out for their forgiveness. My chief sources were the librarians of five libraries, that of the Islamic Medical Centre, those of three Faculties of Kuwait University [Arts, Medicine, and Nursing and Allied Health] and that of the University of London. Mr. Ahmed Juma'a, formerly in charge of English Language teaching in a section of the University of Kuwait, was particularly helpful to me in the translation of Arabic writings. Dr. Hakim Zahour Al-Hassan, then Principal of the Unani Medical College in Hyderabad, India under secondment to the Islamic Medical Centre, provided me with an English Translation of the first book of Ibn Sina's "Al-Qanun". Mr. David Collins of London, England, helped me obtain hard to find literature on Al-Kindi, Az-Zahrawi and others. Dr. Suhas Sanyal, Head of Laboratories at Ibn Sina and Al-Razi Hospitals gave me as a gift the two three volume sets of the Sushruta and the Caraka Samhita dealing with ancient Indian medicine [Ayurvedic Medicine]. Dr. Phil Reavey, formerly Consultant Biochemist at Al-Sabah Hospital, was an ever - willing and most effective critic and proofreader of what I had written. I was my own typist, and am to blame for all typographical errors as well as those which are factual in nature.

Dr. Abdulla Al-Rashied, then Chairman of the Medical Association and Editor - in - Chief of the Association's Medical

Journal, supported my interest over the years and encouraged my writing. Dr. Ahmed El - Gindy, Chairman of the Islamic Medical Centre and Secretary General Assistant of the Islamic Organisation for Medical Sciences, Kuwait, gave me access to the library of the Islamic Medical Centre, its books and its marvellous collection of instruments fashioned after those of Al - Zahrawi [alas, a casualty of the hostilities of 1990 - 1991]. Dr. Abdul Rahman Al - Awadi, present Editor - in - Chief of the Kuwait Medical Association Journal and President of the Islamic Organisation for the Medical Sciences, was kind enough to look favorably on what I had prepared and to have it examined for possible publication.

Finally, I am also grateful to Dr. Mukhtar Bisher, who shepherded this book through the typesetting and printing stages, and who was most helpful in his suggestions for its final layout.

DAVID L. WRIGHT

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Foreword

Man is living in an era where being self-centred has become the rule of the day. Playing "God" has become a very tempting exercise for many who have gone astray.

We are behaving as if we had become masters of the universe, and this despite the words of the holy Quran which say, "وما أوتيتم من العلم إلا قليلا". Knowledge it is only A little that is communicated To you, (O Men!)". This is a blunt warning to man. No matter how much he may think he has achieved, he is only a beginner. Such a notion about our civilization makes books such as this good reminders of man's mortal nature. Many have come before us and many others will come after us. Wisdom lies in knowing how to learn from our past experiences. With it comes the ability to render justice to those pioneers who have preceded us and have made this world what it is.

It is clear from a cursory reading of this work that Dr. David Wright became quite enthused by the subject, which has impelled him to write on it. The subject is Arabic or Islamic Medicine and its unrecognised contribution to modern medicine through its having been taken up many centuries ago by an awakening Europe. As we read through the pages, we learn of the lives of eminent men who lived long ago and who added their own creative thoughts to what they acquired by translating Greek, Persian and Indian authors.

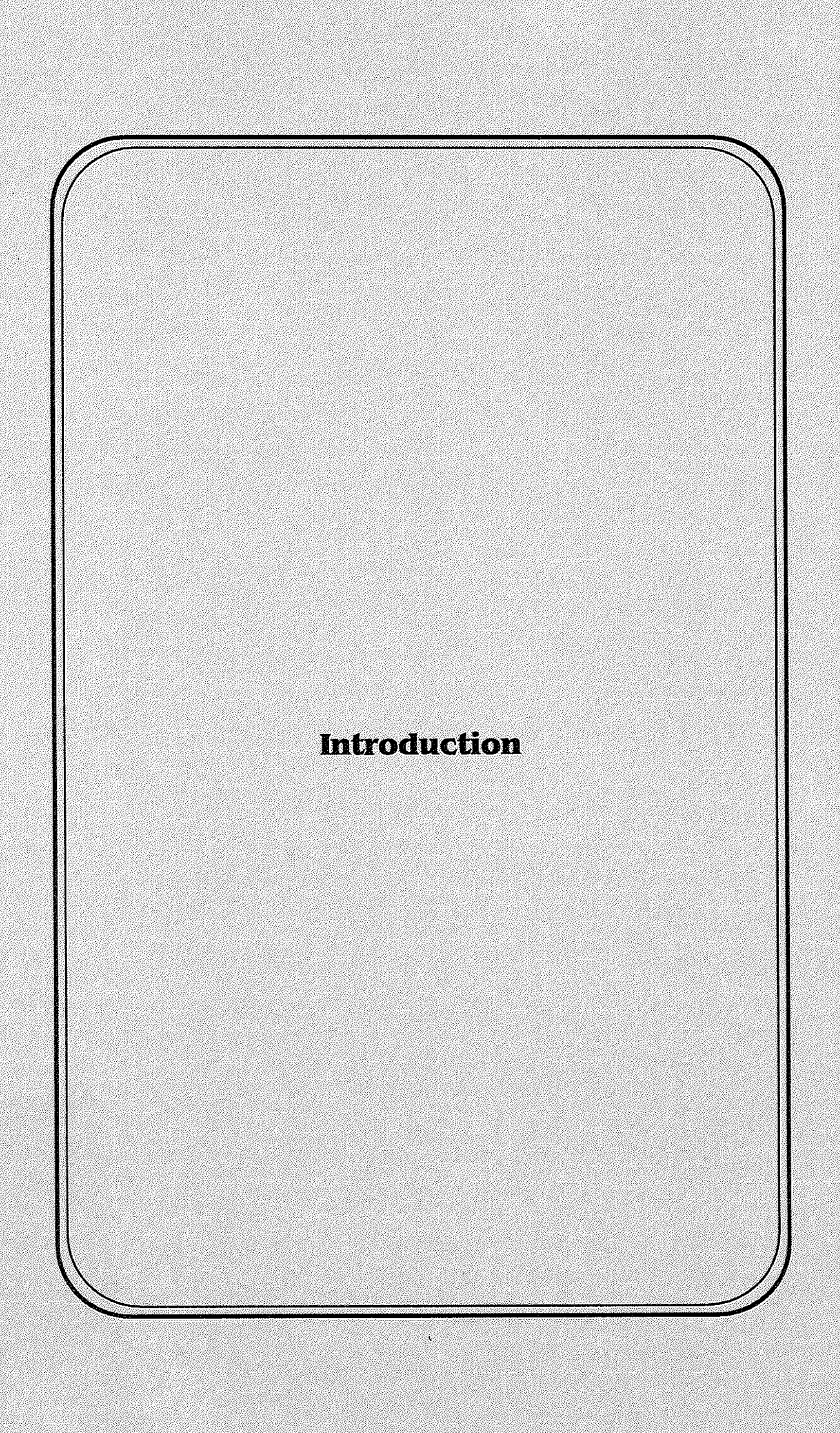
I need not spoil you own exploration of this world of long ago by quoting chapter and verse on it. Suffice it to say that the author's primary aim is to give credit where it is due to our Islamic forebears, who not only saved ancient medical lore which might have been lost forever, but also made significant original contributions to medical science, not the least of these being the concept of induction as a method of deriving general rules from particular observations. It

might even be considered to be the *sine qua non* for science in general for, without it, where is our scientific approach?

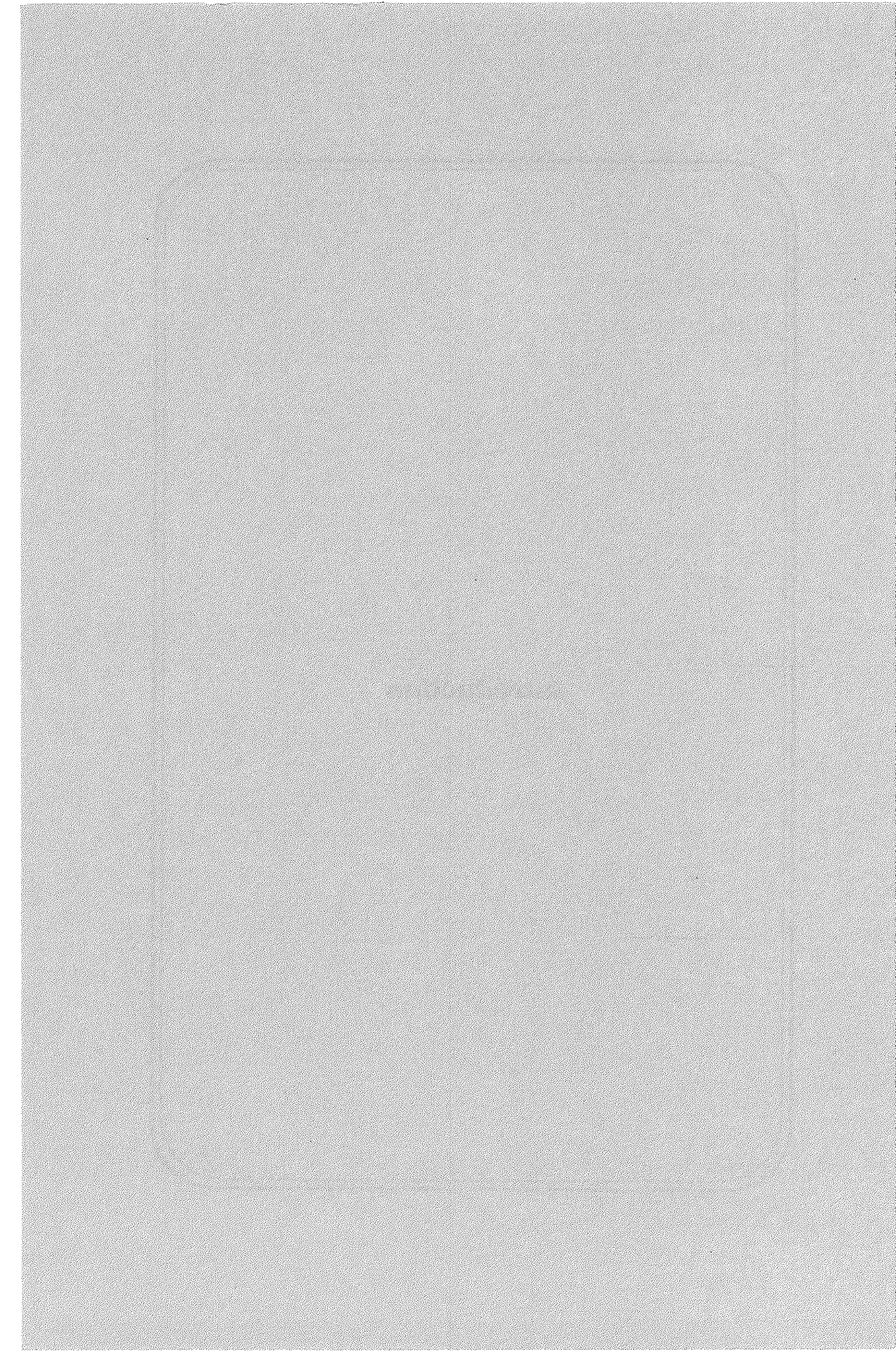
The reader will learn considerably more than the facts surrounding fifteen eminent men of medicine. An attempt has been made to describe the environments in which these individuals lived and the rulers who so greatly affected their lives. This was usually for the good, but some were both enlightened and ferocious! The founding of al-Azhar, the mother of universities, is described as is its efflorescence. We read elsewhere of ar-Razi's frantic and, happily, successful flight from his enraged ruler whom he abused and insulted simply to effect a cure in his amir who was also his patient. Interesting aspects of a surprisingly sophisticated technology are also described such as, for instance, the importation from China via Samarkand of the technology behind the manufacture of paper.

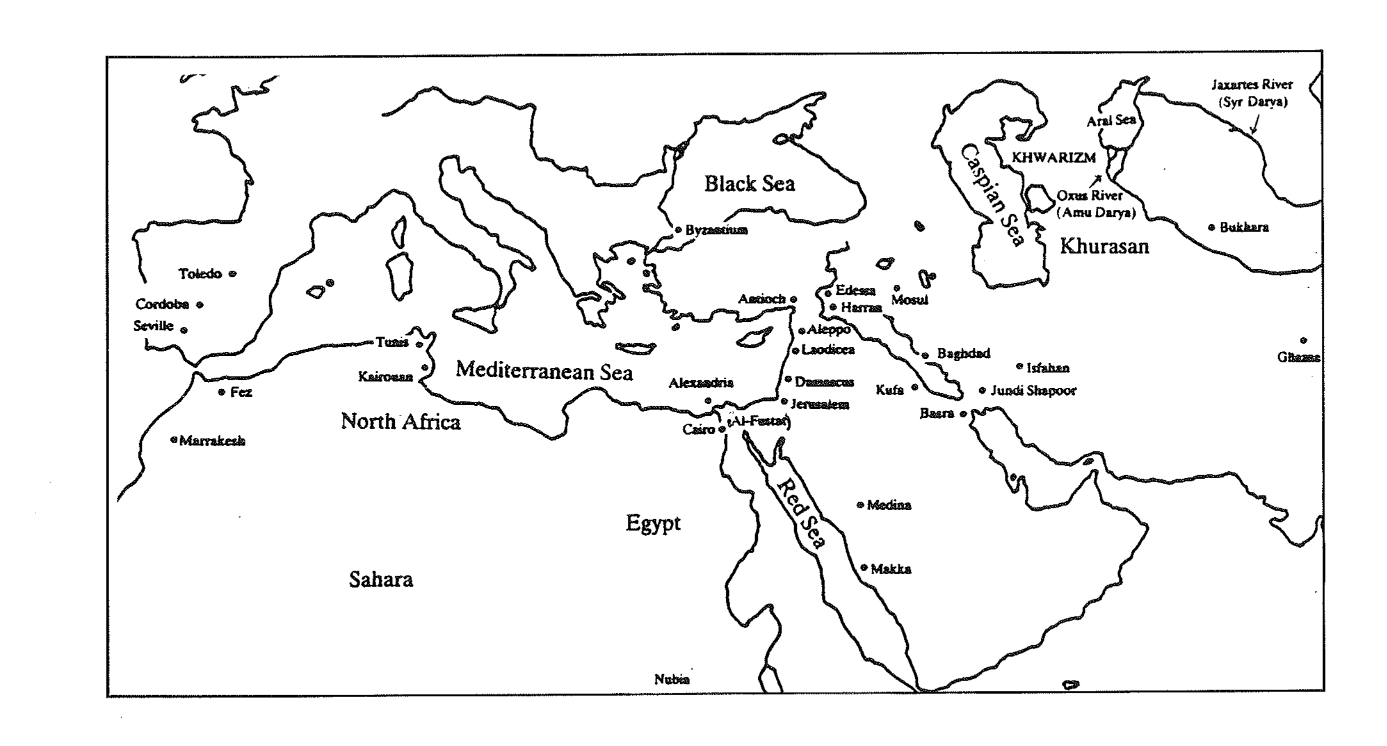
Did you know that an effective administrative system for medicine in general and for physicians and surgeons in particular was created by Arabic Medicine, and that one of its designers began life as a pagan star worshipper living in the ancient city of Harran where, it is written, Abraham once lived? That is not the only strange fact one encounters while reading this book. I recommend it to the reader.

Dr. Abdul Rahman Al - Awadi,
President, the Islamic Organisation for Medical Science

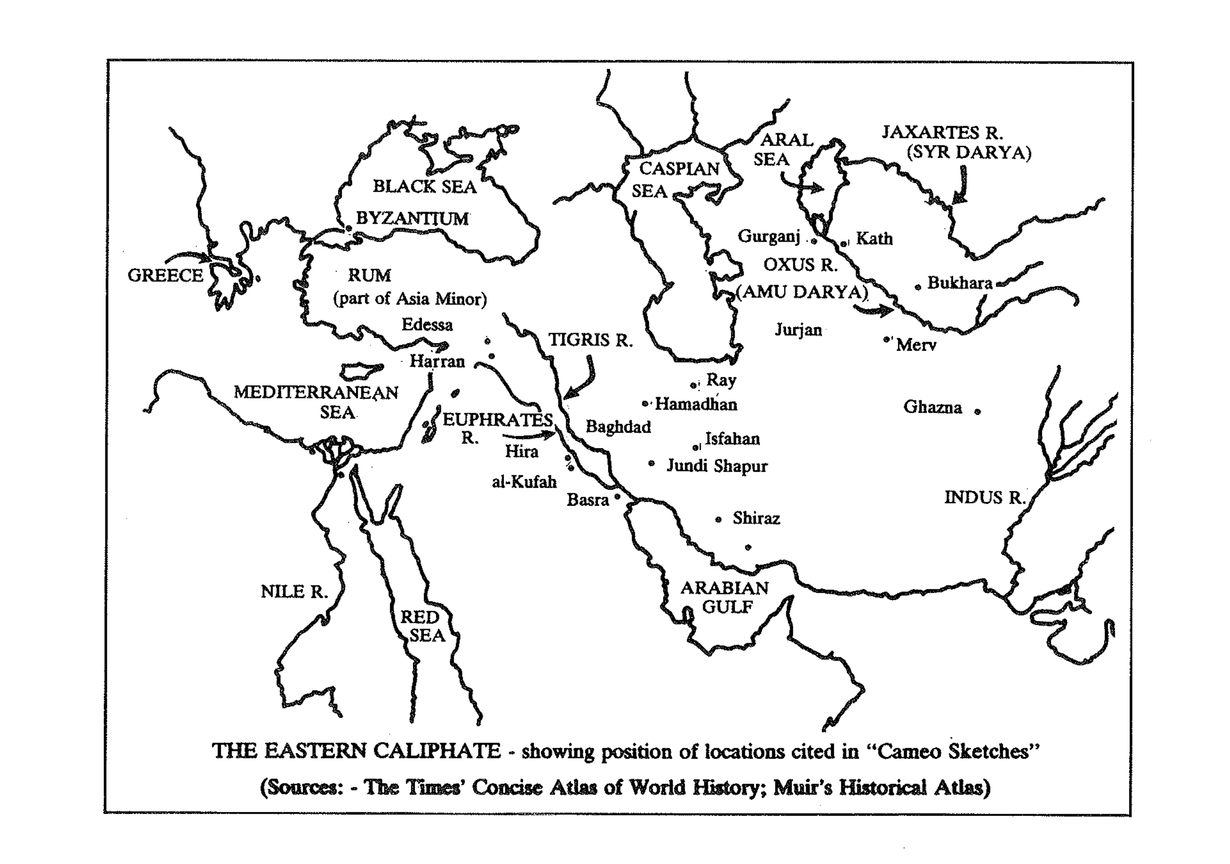


Introduction



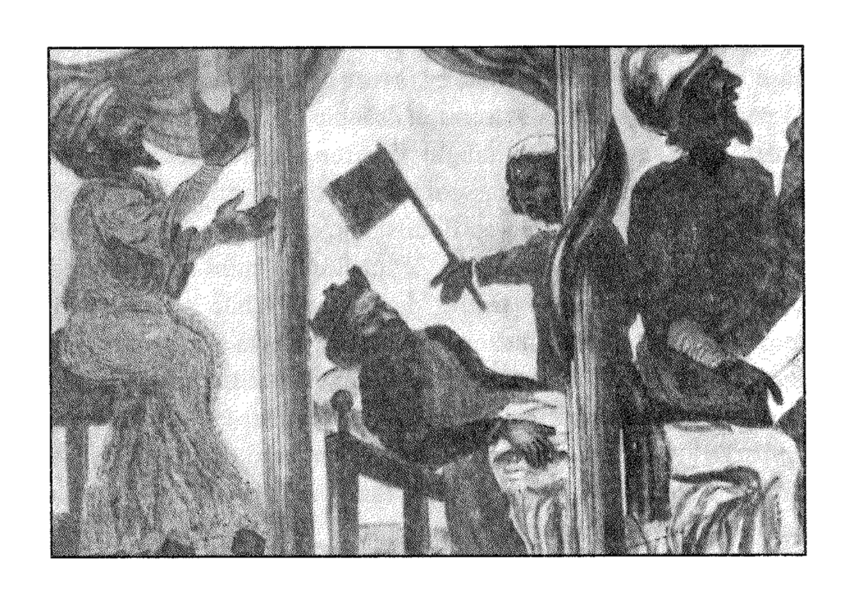


Toledo
Cordoba
Seville
Fez
Marrakesh
Tunis
Kairouan
North Africa
Sahara
Mediterranean Sea
Egypt
Nubia
Alexandria
Cairo
(Al-Fustat)
Black Sea
Byzantium
Antioch
Edessa
Harran
Mosul
Aleppo
Laodicea
Damascus
Jerusalem
Red Sea
Medina
Makka
Baghdad
Kufa
Basra
Isfahan
Jundi Shapoor
Caspian Sea
KHWARIZM
Oxus River
(Amu Darya)
Khurasan
Aral Sea
Jaxartes River
(Syr Darya)
Bukhara



THE EASTERN CALIPHATE - showing position of locations cited in "Cameo Sketches"

(Sources: - The Times' Concise Atlas of World History; Muir's Historical Atlas)



INTRODUCTION

The Empire of Islam

It has always been a hazardous exercise to evaluate the contributions that one culture has made to another or to the world in general, and this is particularly true when the cultures have been in collision for considerably more than a millenium. as has been the case with Islam and Christianity. Most of those in the Christian West learn little of the cultures of Islamic countries and, indeed, much of what they are taught is wrong either because it is misinformed or, worse, because it is based on downright falsehood. The truth is that Islam was flourishing when Christendom was asleep, caught fast in the lethargic intellectual mire that endured over the period known as the 'dark ages'. While a few lonely monasteries in Europe sheltered dedicated monks who worked by the light of candles flickering in their draughty cells to preserve the past, the adherents of this new religion, stimulated by their belief, embarked upon a search for knowledge, and kindled a flame which burnt so fiercely for six centuries that the Muslim world in its entirety was caught up in it.

From the first half of the seventh century until the latter decades of the thirteenth century, the amazing phenomenon which can best be described as the Empire of Islam was born, developed and then flourished at a time when Europe was fragmented and in decline. It's fantastic growth in terms of territory and power is one part of its story which is well known to the Christian West which strove in vain to prevail over it during the Crusades, and which later came to be grateful that its military power was able to bear much of the brunt of the Mongol invasions and, after suffering humiliating defeats and the loss of some of its great cities, finally throw the

invader back. Had Europe stood alone against the Golden Horde, history might well have had a very different tale to tell.

In the days of its ascendancy, the Islamic Empire stretched from Portugal, Spain and Morocco on the shores of the Atlantic in the west as far east as the Indian subcontinent, and further towards the northwest in the region of the Aral Sea in what is now Turkmenistan, Uzbeckistan and Kazakhstan. Vast as it was, this territory was united by the cohesiveness of a single faith, Islam, and by well maintained lines of communication including roads and a postal service.

It must be admitted, certainly, that there was much jockeying for power by the petty rulers of the provinces within it. The life of the reknowned Ibn Sina was much beset by this internal dissension as were the lives of several other eminent people who will be featured in the following chapters. Ibn Maimun from the Western Caliphate was driven first from Andalus where he was born to North Africa, then to Palestine and eventually Egypt. Al-Biruni found himself carried off to Ghazna in Afghanistan, from where he accompanied Mahmoud of Ghazna on ten different expeditions to India.

Early on in its history, the Empire did indeed split into two caliphates, the Eastern and the Western. The Eastern Caliphate took in Egypt and everything lying east of it, and the Western Caliphate which was centred on Andalus (most of present day Spain and Portugal and part of the south of France) included everything to the west of Egypt as far as the Atlantic Ocean. With the rise of the Fatimids, this simple division became complicated by Egypt and parts of the Arabian Peninsula falling into an intermediary region

However, Islam assured its basic unity with respect to trade and communication in general. There were even guide books produced to assist the traveller!! This made possible the quick spread of

information found in one corner of this area throughout the whole of it, and this in turn stimulated an almost frenetic search for knowledge of all sorts.

As it developed, the Empire inherited the infrastructures of earlier civilisations. Islam originated in what is now Saudi Arabia. The territories of Mesopotamia and Egypt were the first to be acquired, after which came the Levant (those lands bordering the Eastern Mediterranean), North Africa, the Iberian Peninsula, Persia and the transoxian lands of Khwarazm. On a historical scale, this occurred explosively over a very short time period. Both the Iberian peninsula, named al-Andalus by the Arabs, and Khwarazm (about 6000 kilometres apart) were taken by the first decade of the eighth century. This guaranteed a reliable and abundant supply of food and, equally important, access to the systems by which these lands were managed as well as the urban centres which served to concentrate the skilled and knowledgeable people in these areas. It gave the Empire room to grow, the energy to sustain itself and the human resources without which the subsequent intellectual efflorescence would not have occurred.

It was also well served by technology and the administrative organisations which supported it. For instance, the secrets of the technology behind the art of making paper which had been discovered by the Chinese were introduced to the Empire of Islam in 704 A.D. when Samarkand fell, and a factory for the making of paper was in operation in Baghdad in 794 A.D.

Indeed technology generally and its benefits are not a modern acquisition. Certainly the basic details of glass making, ceramics, iron and steel production, non-ferrous metallurgy, paper making, the production of inks, textiles, chemistry, bridge making, the construction of dams and irrigation canals and military weaponry, were known and surprisingly well developed. Ahmad Y. Al-Hassan

and Donald R. Hill have described this in detail in their fascinating book, "Islamic Technology - an illustrated history".

The enlightened and tolerant attitude of Islam guaranteed a safe haven to adherents of other religions, and this and the active encouragement of the Abbasid caliphs in the Eastern Caliphate and others such as Mahmoud of Ghazna from the eastern edge of the Eastern Caliphate and Abdul Rahman III in the Western Caliphate produced an extended era during which the search for knowledge in general was its 'Leitmotiv'. This situation endured for more than six centuries.

Islam was able to meet and eventually defeat the attacks of a militarily resurgent Europe and still flourish. The Christian occupation of Jerusalem which occurred during the first Crusade lasted less than a hundred years from 1099 to 1187 A.D. when Salah ad-Din, the magnificent and admirable opponent of Richard the Lionheart, liberated it. Even after the arrival of the Mongols their further attempts continued to be repulsed. However for whatever reason, the astonishing era of intellectual growth, the Golden Age of Islam, was drawing to a close. Baghdad fell to Hulago in 1258 A.D. The Mongols never reached Egypt, and indeed they were later defeated and driven back, but the vital spark seemed to have gone.

Islamic Medicine

There is, however a second story connected with the Empire of Islam which is not familiar to the West. This story is as fantastic as is the first, but it deals with an empire of the intellect rather than one of the sword. After the Arabs had expanded out of the Arabian peninsula and organised the lands they occupied, they took up a new challenge, that of expanding their intellectual horizons. This book deals with one aspect of the Islamic Empire of the Mind, the foundation, development and maturation of Arabic Medicine. It

also seeks to describe how important Arabic Medicine was to the later establishment of medicine in renascent Europe.

In fact, self-destructive factionalism in Christendom did much to prepare the ground for its birth in the first place. The schism within Christianity which occurred in 431 A.D. when Nestorius, the Patriarch of Byzantium, and his supporters were expelled and fled to Edessa had forced out of Europe many of its finest savants, and their move to the Middle East contributed significantly to the already large pool of intellectuals available in this region. The subsequent move of many of the Nestorians to Jundi-Shapur, a city founded by the Sassanids "to outshine Antioch", concentrated this knowledge in a site which was already replete with the contributions of earlier workers, notably the Syrians, Persians and Jews. Justinian I [527 -565 A.D.], in his later expulsion of the "heathen philosophers" from Athens and Alexandria further augmented the ranks of Jundi-Shapur's savants.

Arabic Medicine - or, more properly, Islamic Medicine - drew heavily on the knowledge of the ancient Greeks (Hippocrates, Aristotle, Galen etc.) through manuscripts left behind by them which were made accessible by their being translated into Arabic, either directly or from first translations into Syriac. Indeed, this age of translation made available manuscripts from other regions such as India (cf Sushruta, a surgeon and physician of the sixth century B.C.), Persia and to a lesser extent China as well.

The writings on Arabic Medicine were overwhelmingly set down in Arabic. Even those who were not Arabs (such as the Jew, Ibn Maimun, or Maimonides) made use of it.

The roots of Arabic Medicine extend back at least to the seventh century when Khalid bin Yazid (655 - 704 A.D) began to acquire translations of Greek manuscripts from Alexandria which fell to the Arabs in 641 A.D. when Islam expanded into Egypt.

The major source of expertise and knowledge was, however, the previously mentioned Jundi-Shapur, a city which lay in what is now the southwest of Iran (near present-day Ahwaz) to which the Nestorians had fled to escape persecution from Byzantium. They and other savants had made Jundi-Shapur the prime repository of Greek knowledge, and this began to be tapped when the caliph al-Mansur enticed Jurjis bin Jibra'il Bukht Yisa to come to Baghdad in 765 A.D. The territory of Mesopotamia was first invaded by Muslim armies under the first Caliph, Abu Bakr, in 633 A.D. This had led to the conquest of the Sassanids in Persia shortly afterwards, and gave the Muslims early access to Jundi-Shapur as well.

The fact that the inhabitants of Jundi-Shapur as well as other eminent savants enticed to Baghdad were accomplished linguists is of pivotal importance. It opened the gates of knowledge to the Empire of Islam and made the Arabic language the prime repository for works on medicine, science, astronomy, technology, philology, philosophy and indeed learning in general.

It is perhaps not appreciated that Islamic medical men had recourse to various agents for the treatment of pain. Ibn Sina and others have described the use of drugs and aromatic substances to produce analgesia and even anaesthesia. Their surgeons possessed a considerable number of instruments designed and produced by themselves. Az-Zahrawi himself described more than two hundred. A fine collection of replicas of some of these were formerly exhibited in the Kuwait Islamic Medicine Centre, but were, alas, lost during the invasion of 1990. Many of these savants have left written descriptions of drugs in use in medicine. Ibn Sina lists 760 (972 according to Hakim Mohammed Saieed); al-Biruni lists about 850.

It is also not generally realised that a system of examination, registry and control of doctors and others was well developed

during these ages and that well run institutions for the training of doctors existed as parts of well cleaned and aired hospitals in cities such as Damascus, Baghdad, Cairo and Cordoba which were maintained for hundreds of years. Their precursors had existed before them in Jundi-Shapur, Edessa and Byzantium. Indeed, in some of these Islamic hospitals, care was delivered free of charge, and the discharged patient was given a stipend to tide him over any convalescence!

One of the earliest hospitals founded by the Arabs was that built in Damascus in 707 A.D. by the Caliph El-Welid. The thirteenth century Al-Mansuri Hospital in Cairo had four large quadrangles each containing a magnificent fountain. It had wards for specific types of disease and wards set aside for male and female patients and possessed a large library for study, together with lecture halls, a mosque and separate administrative quarters. In 1160 A.D., a Jewish traveller found some 60 dispensaries and infirmaries in the city of Baghdad alone.

Obviously, the fact that this story is spread out over six centuries indicates that Arabic Medicine was no 'flash-in-the-pan' event. Certainly, it was guided by men of genius such as Hunayn Ibn Ishaq, Al-Razi, Ibn Sina, Al-Majusi, Az-Zahrawi, Ibn Maimun, Al-Biruni, Ibn Al-Haitham and others, but just as surely it was based on the long-lasting infrastructure of the myriad, well-informed, working doctors and scientists in general who can never be counted, but who nonetheless made the brilliance of the outstanding few possible.

Individuals within the Empire of Islam made significant contributions to the advancement of medicine. Amongst these were Hunayn Ibn Ishaq's adaptation of the Arabic language to medicine and science in general and his masterly translations of earlier Greek works, az-Zahrawi's rescue of the practice of surgery from the general indifference of most intellectuals and his technical expertise

in the design and construction of surgical instruments (as well as his description of haemophilia), ar-Razi's original description of measles and smallpox and his enormous written work called "The Continent" in which his medical knowledge and that of his predecessors is minutely documented, and ar-Razi's and Ibn al-Haitham's development of the method of inductive reasoning, the basis of modern science. Their works and that of some other eminent practitioners of medicine during the Golden Age of Islam are covered in this book.

The contribution of Islamic Medicine to the development of European Medicine

The Medical knowledge accumulated by the Empire of Islam became the most important stimulus to Medical Science in a Europe newly awakened from the relative inactivity of the Dark Ages. From the point of view of Europe, the prime importance of this Empire was (and is) the gift of knowledge passed on to it by the Arabs. Two major centres were responsible for this. the first in importance was the School of Translation founded by Gundisalvi in Toledo, Spain, in which Gerard of Cremona played an outstanding role. Second was the School of Salerno in Italy to which Constantus Africanus made significant contributions. Original Arabic works as well as Greek works only found in their Arabic translations were translated into Latin. For many hundreds of years they formed the major source of medical knowledge used by the European centres of learning such as Montpellier, Paris, Padua, and Bologna. For reasons which are not all admirable, the Arabic contribution to the renaissance of Europe has been grossly underestimated.

Constantinus Africanus (1020 - 1087 A.D.) was born in North Africa, in Carthage in what is present day Tunisia. A visit he made to Salerno in Italy showed him how lacking this part of Europe was

in medical knowledge. For some reason, he was seized with the desire to impart as much Islamic Medicine as he could to the Italians. He was already fluent in both Latin and Arabic, and he became determined to perfect his knowledge of Medicine so that he could realise this aim. His wanderings in pursuit of medical lore are said to have taken him to Egypt, Baghdad, Syria and India. And indeed, he produced many fine Latin translations of the works of those eminent in Islamic Medicine after he retired to the Monastery of Monte Cassino. Unfortunately, he neglected to mention that he was not the original author of many of these works. Before we criticise him for this, we should perhaps note that he was living in a society which considered Islam its principal enemy.

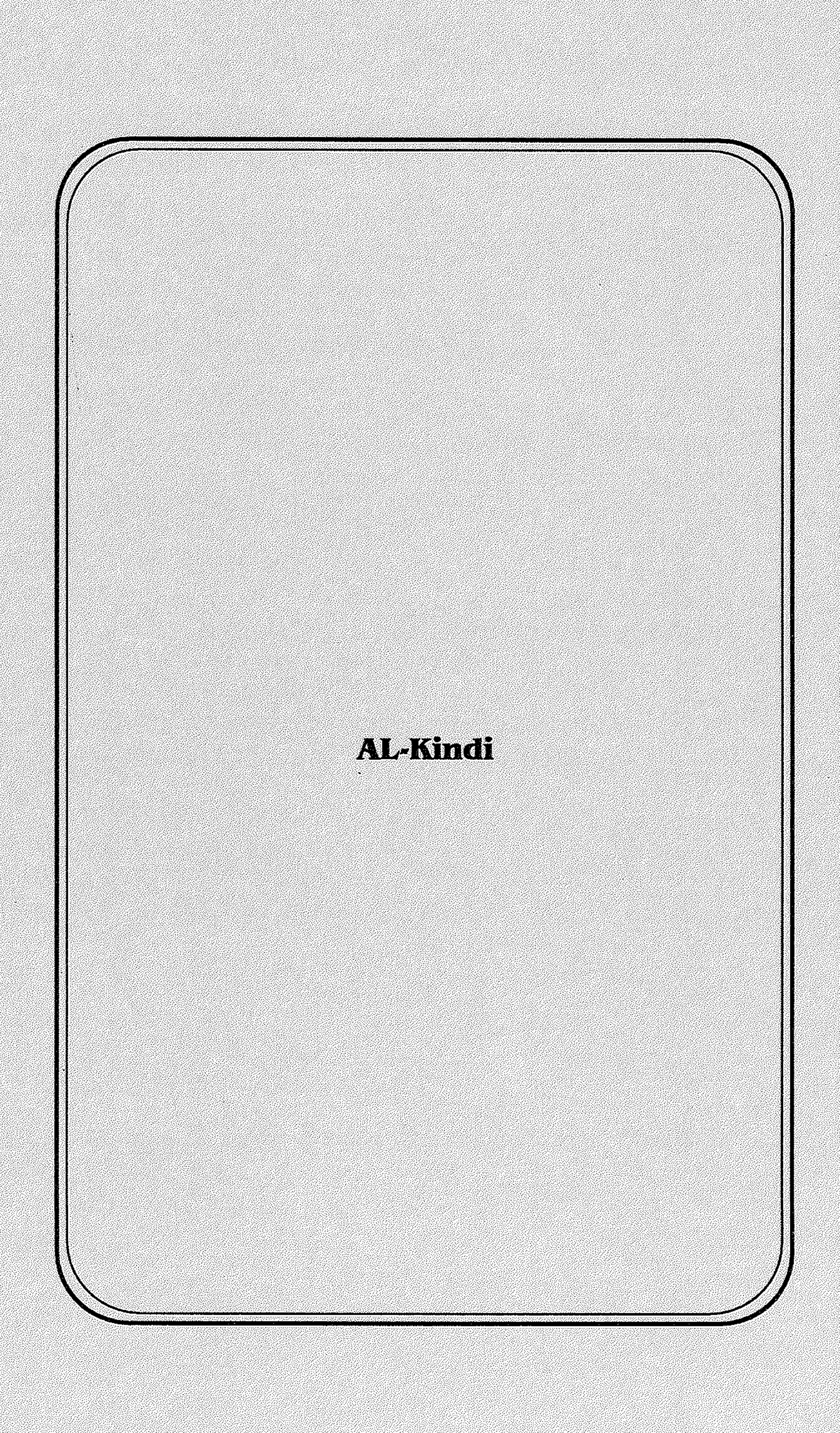
Toledo became the home of Gundisalvi's "School of Translators" in about 1130 A.D., and when Cordoba was lost by the Arabs in 1236 A.D., it and Seville also became sources of knowledge held by the Arabs. The University of Seville maintained a position of pre-eminence as a centre for the study of Arabic. Some have criticised the output of these translators, because it was based on a rigid word for word translation which sometimes clouded the original meaning. Johannitius and the House of Wisdom in Baghdad based translation on the sense of the document. Johannitius and his colleagues would first ensure they understood fully the Arabic before they translated the meaning rather than the vocabulary of the text.

Salerno had existed as a place of healing from sometime in the ninth century, According to Hijazi Abdul Rahim, patients were cared for in a convent where the practices employed derived from a monk named Desire, who was later to become Pope Victor VIII. Constantinus Africanus is said to have reinvigorated it after his arrival in 1077 A. D. It became the first organised medical school in Europe and was the parent school for those at Montpellier and Paris in France, and Bologna and Padua in Italy.

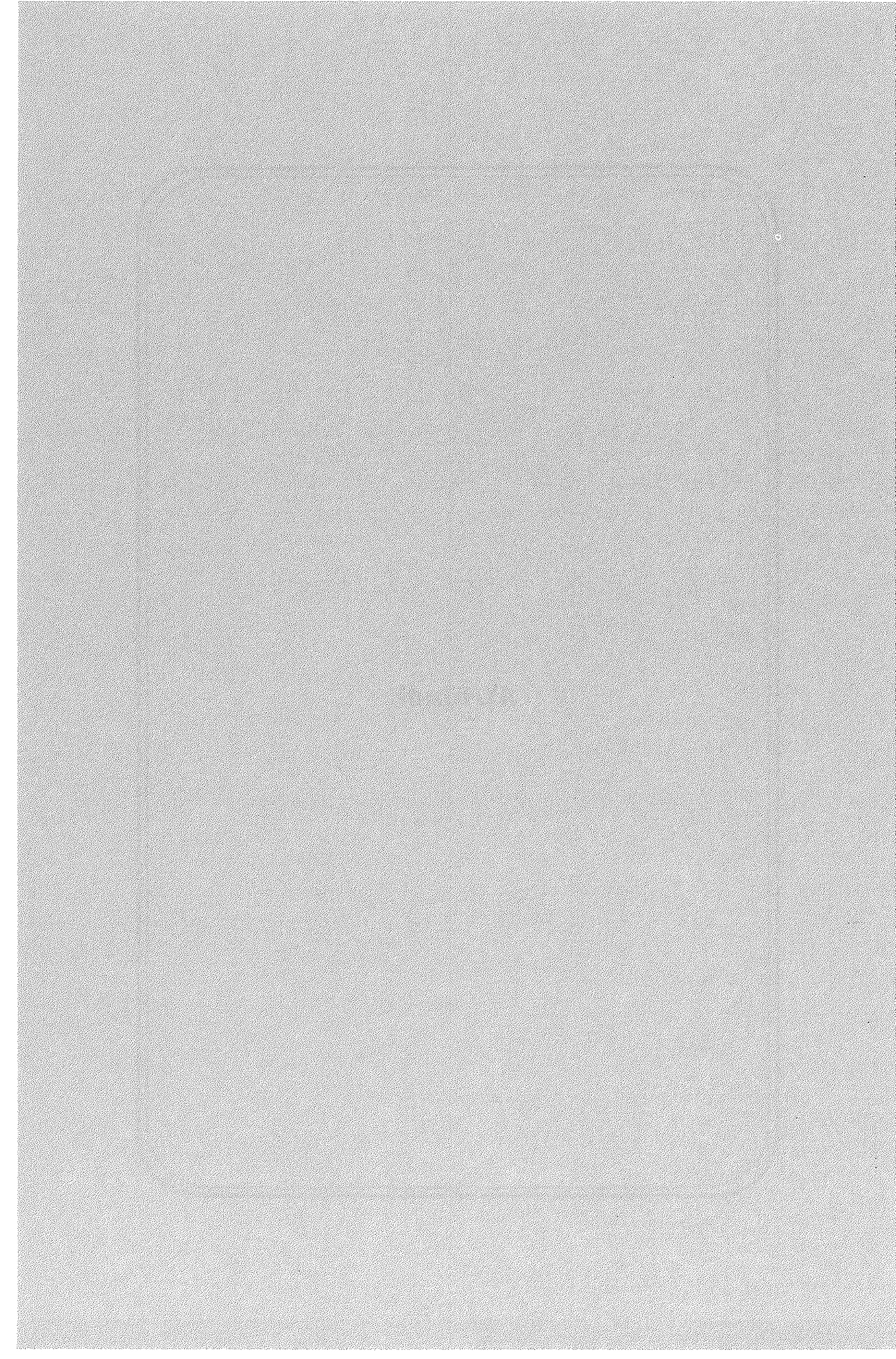
Most of the texts used in these early schools were Latin translations of Arabic texts among which were:

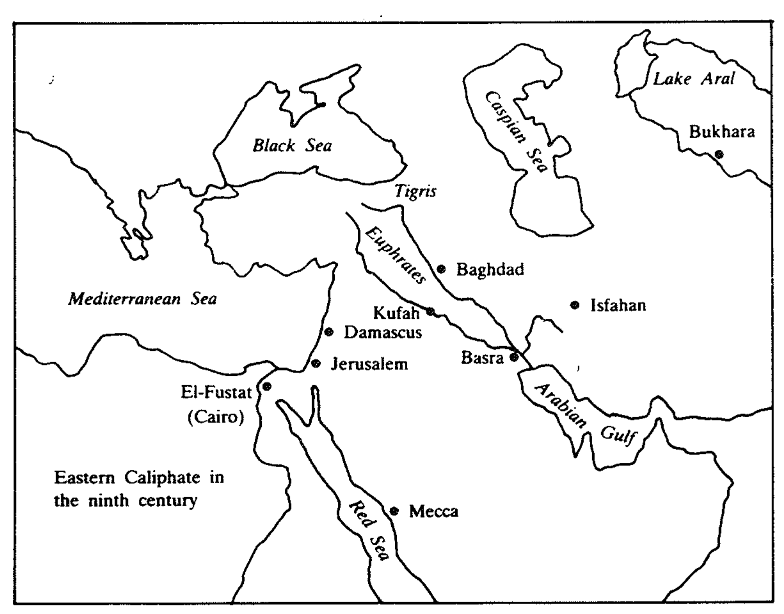
The Continent (Al-Hawa) of Al-Razi	*[A vast compilation of Ar-Razi's notes on his patients and discussions of the work and ideas of his predecessors]*
The Qanun of Ibn Sina	*[Five major sections, the first being on general principles, the second comprising a pharmacopoeia]*
Al-Kitab al-Malaky of al-Majusi	*[Ten chapters on theoretical and a further ten on practical medicine]*
Aphorisms of Hippocrates and Galen by Musa ibn Maimun	*[Contains 1500 aphorisms or "terse formulations of a truth"]*
Treatise on poisons and their antidotes by Musa ibn Maimun	*[discusses animal poisons, vegetable and mineral poisons and treatment and antidotes]*
Kitab al-Tasrif li-man 'ajiza an aTa'alif by Abu al-Qasim az-Zahrawi	*[a Latin translation of the part on surgery was used in Europe up till 1500 A.D. It deals with cautery, amputations, lithotomy, fractures, wounds]*

It cannot be disputed that the early influence of Islamic Medicine on the development of medicine in Europe was formidable. It is equally true that the passing on of the scientific method known as inductive reasoning allowed the development of Western science generally. Entailing as it does experimentation, observation and a subsequent move from the particular to the general, it is basic to the scientific approach to the investigation of any problem. The science of Medicine is no exception to this rule.



AL-Kindi





Adapted from: Muir's Historical Atlas-Ancient, Mediaeval and Modern, Treharne and Fullard, eds. Book Club Associates, London 1973

Al-Kindi {The Philosopher of the Arabs}

[801 - 866]

(Abu Yusuf Ya'qub Bin Ishaq Al-Kindi)

"Al-kindi is the first of a galaxy of great Muslim thinkers whose humanistic and scientific works helped shape the trend of the medieval Arab renaissance....His writings which include works on all current sciences of his time put him in a unique position to help establish the relations of Arab-Muslim philosophy with earlier philosophies and with the following generations of Muslim thinkers who deal with metaphysical, and scientific problems." (quoted from George N. Atiyeh in his 'Al-Kindi: the philosopher of the Arabs')

Abu Yusuf Ya'qub bin Ishaq al-Kindi was born in Kufah in about the year 801 A.D., the son of Ishaq ibn al-Sabbah who was governor of Kufah (or Basra, according to Sleim Ammar) under the caliphs al-Mahdi (775 - 785 A.D.) and al-Rashid (786 - 809). The name, al-Kindi, comes from his having stemmed from the Kindah tribe whose homeland was the southern part of the Arabian Peninsula. His family was an illustrious one, with his great grandfather having been a Companion of the Prophet, and with more distant royal ancestors. Among the latter, Al-Mahdi and Maouya had ruled in Hadhramaut. Others had done the same in Yamama and Bahrain. Indeed, Ibn Abi Usaybi'a has listed his genealogy through more than thirty generations ! Although very little seems to be available on his early life, he is known to have moved to Basra to further his education; most of his working life was spent in Baghdad.

He became a polymath - a man of extensive learning over the whole spectrum of human knowledge as it stood at that time (including that of the Ancient Greeks, Persians and Indians), and he forged a bridge between the knowledge of the ancients and that of

Islam. Sleim Ammar quotes him as follows: "My principal consists of first transcribing totally whatever the ancients have left on the subject. Secondly, I complete whatever they have not expressed fully, and I do this according to the usage of our Arabic language and in keeping with the mores of our time and our capacities."

Al-Kindi was an Arab Muslim who lived during the era of the translation of Greek and other manuscripts in which Hunayn ibn Ishaq and other non-Muslims played such a great role. However, al-Kindi is not known for his translations - although he almost certainly did some translation from Syriac into Arabic, and may possibly have done the same from the Greek language.. He is instead known as "The Philosopher of the Arabs" - obviously for his work in philosophy, but also on account of his abilities in so many other subjects.

Al-Kindi had the good fortune to live during the reigns of the caliphs al-Amin (809 - 13 A.D.), al-Ma'mun (813 - 833), al-Mutasim (833 - 842) and al-Wathiq (842 - 847) and the bad fortune to live during the reign of al-Mutawakkil (847 - 861). During this period, as George N. Atiyeh points out, communications throughout the Empire of Islam were much improved. New and good roads were built, and a postal system was instituted. Guide books to the various provinces were even produced! Al-Ma'mun established the "House of Wisdom" and the writings of the ancients became available due to the efforts of many workers of Syrian, Nestorian, Jewish and Sabean derivation who were drawn to Baghdad. It was a Golden Age for Islam, and Baghdad was the pre-eminent city of the empire. During the period from al-Ma'mun to al-Wathiq, the social climate favoured al-Kindi and he prospered and produced written works on an astonishing range of subjects from philosophy to the art of cookery. He became a royal teacher, and perhaps royal physician as well under both al-Ma'mun and al-Mutasim, and he

was appointed tutor of al-Mutasim's son, Ahmad. Many of his later works were dedicated to the latter.

That such a climate so amenable to the establishment of philosophical and scientific movements should have arisen would seem to be partly explained by the decision of the caliph al-Ma'mun to adopt in 827 A.D. some of the tenets of a group known as Mu'tazilites ("those who withdraw into themselves and stand aloof"). Mu'tazilism introduced the application of rationality to the interpretation of religious dogma. They felt the law should be defended by having recourse to logic and reason. Sleim Ammar notes that the doctrine of the Mu'tazilites was based on five essential themes, the first being that of the oneness of God. Implicit in this first tenet was the belief that God was an entirely transcendental being and as such He was inaccessible (this led them through a chain of reasoning based on the foregoing to proclaim that the Qoran had been "created", and it would seem that it was al-Ma'mun's proclamation of the "created" Qoran in 827 that stimulated so much resistance on the part of more orthodox Muslims). Secondly, they held that God does no evil and that His justice is divine. Hence, thirdly, man is therefore responsible for his own acts, be they sinful or otherwise. Fourthly, they believed that the former implied among the lapsed faithful an intermediate state between faith and impiety and they called for repentance on the part of the sinful believer. Finally, they held it to be man's duty to prohibit evil and do good. They believed it to be incumbent upon the Imam to keep the faithful on the right path. Unhappily, when they were at the height of their influence, the Mu'tazilites themselves persecuted those who seemed to disagree with them, and this may have strengthened the hands of the more orthodox who opposed them on theological grounds.

Atiyeh remarks that there were two ways open to the followers of Islam. The orthodox way led to the rise and development of

sciences such as philology, history and jurisprudence. The 'less orthodox' way, which arose through the influence of the Greek, Syrian and Persian cultures led to the rise and development of philosophy, mathematics, astronomy, the physical sciences and geography. The Mu'tazilites (and al-Kindi) favoured the second road. The more orthodox favoured the first and opposed the second.

Al-Kindi was very sympathetic to Mu'tazilism, but Alfred L. Ivry feels that he did differ with them. He writes, "While they {Mu'tazilites} take their point of departure from the Qoran and tradition and use whatever philosophical tools they feel appropriate to explain and support their faith, al-Kindi, it appears, begins from a philosophical body of literature and tradition, accommodating it to religious doctrine wherever he can and asserting religious dogma wherever he must, but essentially aiming for a coherent philosophical affirmation of the truth."

Al-Ma'mun was in his own right an intellectual, and he was doubtless drawn to the second road and Mu'tazilism because of its reliance on logic and reasoning. He is reported to have recounted a dream he had in which he spoke with Aristotle, and was assured by him that both philosophy and the Shari'a (law based on the Qoran) led to the same truth.

As has been stated, not all the faithful were able to agree with the foregoing, and orthodox resistance to it sprang up. A very prominent and persistent leader of this resistance was named Ahmed ibn Hanbal (780 - 855). This man was imprisoned for a time because of his views, but with the accession to power of al-Mutawakkil, who leaned towards the orthodox way, the views of ibn Hanbal and his more orthodox 'Hanbalite' supporters were listened to. He opposed al-Kindi, whom he considered to be a Mu'tazilite. Al-Mutawakkil also disagreed with Mu'tazilism, and he officially denied the doctrine of the "created" Qoran. Philosophy

and philosophers fell out of favour, and al-Kindi's situation changed for the worse. The ills that were to befall him were not solely due to this however. His success had roused the jealousy of some courtiers who were the sons of one Musa bin Shaker (Bani Musa). These men had a reputation for intriguing against those whose knowledge and intellects overawed their own. It is probably mostly due to their machinations that he fell from grace to the extent that his library (famous enough to be known in his time as "Al-Kindiya") was confiscated for a time and he was possibly subjected to physical punishment. Although he succeeded in recovering his library, he never again attained his previous eminence, and in the end his death was to be a lonely one in conditions of disgrace. Different dates for his demise have been suggested, ranging from 866 to 880.

Al-Kindi acquired a reputation of being avaricious, although some of his utterances, translated and reproduced by Atiyeh, would seem to belie this ("How exceedingly bad is miserliness to every sensible person; "A niggard is not noble"). He was also known for his wit. A statement of his quoted by Atiyeh might indicate a certain asceticism ("The users of intoxicants allow morbidity to enter their brains and as the body succumbs to intoxication, the brain becomes diseased, weakness grows and the faculty from which spring actions declines and is ultimately lost. So, who can be a bigger ill wisher of his own self than he who is a cause of the destruction of his own life?"). He preserved his patience and good nature even in the midst of tempestuous arguments ("He who remains calm in the face of provocation, destruction never meets him."). In one instance, his tact and diplomacy made a disciple of one of his opponents. Al-Kindi sent a mathematical savant to his opponent (Abu Machar) and the savant was able to enthuse him with a passion for astronomy. This subsequently led, it is said, to Abu Machar becoming a supporter of the teachings of al-Kindi. He was both

virtuous and wise, according to Alfred L. Ivry who writes the following of him: "True, his logic is not analytical and his philosophy not particularly consistent; yet there is no denying his erudition and industriousness, his attempt to comprehend and convey past philosophies as parts of an essentially unified tradition, and his desire to select from this tradition that which would make for a viable philosophy in an Islamic society."

He was not a courtier, in the sense that he felt no need to attend the persons of the sultan or rich businessmen in the hope of currying their favour. He was, of course, an aristocrat and, perhaps, he had no need to do so. As George N. Atiyeh writes, "Al-Kindi was of a noble character unlike many of his contemporaries and conducted himself like a dignified, dedicated and disinterested person."

Among the treatises of al-Kindi listed by Leclerc, 16 were on philosophy, 11 on logic, 11 on arithmetic, 6 on music (Sleim Ammar counts 13), 22 on geometry, 17 on astrology, 11 on politics and 22 on medicine.

First and foremost, Al-Kindi was a philosopher, and his best known work is 'On First Philosophy', which is based on his assumption that to know things, one must know their causes, and most particularly, the ultimate cause, the "True One" which to him is "First Philosophy". In this work he opposes those not appreciating the philosophical traditions to the extent that he calls for their ouster from positions of religious leadership within the community (Alfred Ivry).

Altogether, he wrote at least 16 treatises on philosophy. Among those on Aristotle were 'The human spirit', 'Sleep', 'Dreams and visions'. He also wrote on an 'Epistle on the soul'.

Al-Kindi came to believe in "creatio ex nihilo" (creation from nothing), and he used a vocabulary which was similar to that of the Mu'tazilites, and was consequently suspected of Mu'tazilite leanings because of this. Although he opposed the traditionalists

and championed the Greek philosophers, Jolivet and Rashed (Encyclopaedia of Islam) state, "On the other hand, al-Kindi, who ceases to follow the Greeks where they are in disagreement with the Qoranic revelation (i.e., with regard to the creation, and the life-span of the universe) is interested in establishing or formulating agreements between certain philosophical ideas and certain articles of the Islamic faith, even Mu'tazili ones."

Before the time of Ibn Rushd, he made a distinction between human and divine science in such a way that the two coexisted in harmony. Latterly, al-Kindi adhered to the doctrine of the creation of the universe by God starting from nothing (which Atiyeh suggests is the assumption of a fifth 'cause' additional to the four Aristotelian 'causes', the material, the efficient, the formal and the final), and later still, he leaned towards mysticism (Sleim Ammar).

He mentions Plato and Aristotle by name in his philosophical works, and the contents of these works imply that he must also have been familiar with Epictatus, Proclus and John Philoponus. Some of his works were later available in Latin.

He is not renowned for his contributions to medicine in the way that ar-Razi and Ibn Sina are, but is nonetheless credited with having composed 22 to 24 works on this field. Most noteworthy, perhaps, is his application of mathematics to the formulation of compound medicines. Atiyeh notes that al-Kindi believed the efficacy of a compound medicine corresponded to the proportions of the "sensible qualities" (warm, cold, dry and moist) present, and that adjustment of the mixture's efficacy with respect to one of these 'sensible qualities' was based on a geometrical progression. He writes, "If a compound medicine is to be warm in the first degree, it must possess double the equable mixture, if it is to be warm in the second degree, it must possess four times as much; and so on in the progression two, four, sixteen etc. The idea of harmony between the sensible qualities is original with al-Kindi."

He wrote on many other medical topics, including rabies, stomach ache and gout, elephantiasis, fevers and their types, crises in acute illness, foods and medicaments which are poisons (and antidotes to poisons), vapours with curative powers, the difference between sudden madness caused by the devil and that due to bodily dysfunction, and the use of medicine. Also found among his medical treatises are those on the medicine of Hippocrates, the 'simples' of Galen, the quality of the brain and one on psychological medicine.

Al-Kindi was also a chemist, metallurgist, engineer and physicist. He is still renowned for his work in practical technology. Atiyeh suggests that this practical knowledge must have been used in civil engineering in the design and construction of bridges and aqueducts as well as in the fashioning of engines of war and balances. Al-Hassan and Hill (Islamic technology: an illustrated history) describe how he included in his writings on the technology of iron and steel the specifications of Mayzad bin Ali, a blacksmith of Damascus, on sword making. He describes construction of the furnace, the composition of steel, the construction and design of crucibles, the varieties of clay used and other aspects of this technology. In his treatise, the 'Book of perfume chemistry and distillation' are to be found designs and descriptions of a retort-type still set in a water-bath above a stove and another provided with an annular ring. Al-Kindi remarks. "in the same way one can distill wine using a water-bath and it comes out the same colour as rose-water." There were 107 methods and recipes for perfumes and distillations given in this treatise, including methods for extracting oils from cotton seed and mustard seed.

In his capacity as an astronomer, it is recorded that in 840 A.D., he spent three months observing sun-spots, which he attributed to a transit of Venus across the face of the sun. A propos the former, he wrote on the science of optics. His improved adaptation of Euclid's

treatise on optics, which was available in Latin, is said to have influenced Roger Bacon. He also produced treatises on 'Revolutions of stars', 'Meteors', 'Sphericity', 'On the cause of the halo around the sun, the moon, the stars and other luminaries.' and 'The influence of stars'. He was a believer in astrology and wrote widely on this subject, including the following treatises: 'On the heavenly bodies called luck and bad luck', 'On good omens', 'On the correct way to construct a horoscope model, a Hilaj and a Katkhuda' and 'On the duration of the rule of the Arabs'. With respect to the latter, Atiyeh notes that he predicted its extent to be 693 years after the Hijra (622 A.D.), i.e., the year 1315 A.D.

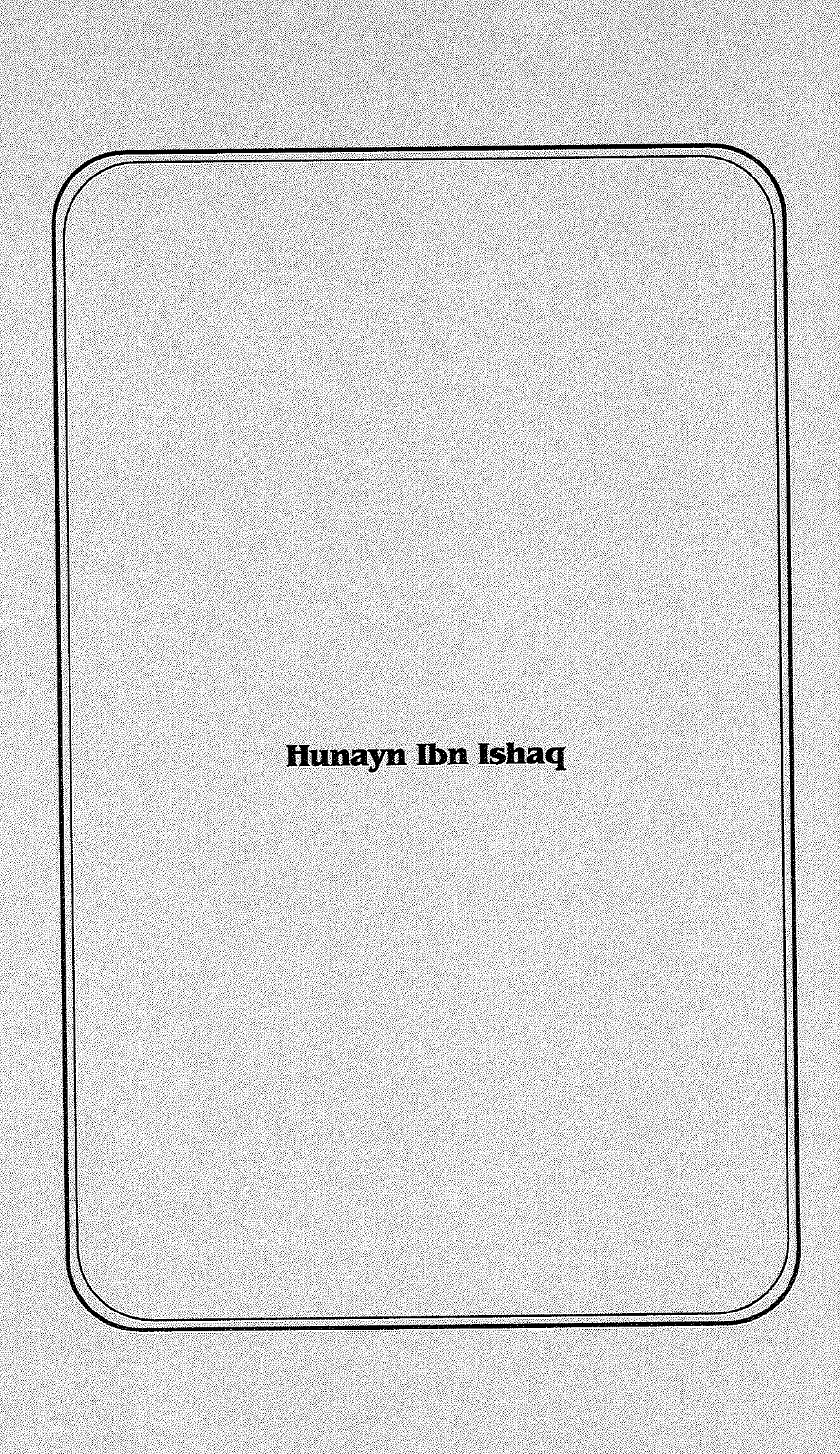
He produced many treatises on music, and was the first to show an interest in its theory, adopting an alphabetic notation as well as the concept of the octave. Sleim Ammar has reproduced an anecdote cited by Ibn Al-Qifti which illustrates how al-Kindi saw music as a therapeutic tool. In it a young boy is brought back from seeming death by musicians playing over his ear (unfortunately, the boy expired when the music stopped !). He also notes that a group of free thinkers were inspired by al-Kindi's work on music to demonstrate how it "could lead to spiritual understanding by awakening the soul to the harmony of the universe and inviting it to transcend material existence". They would seem to have used trumpets to accentuate and clarify experiments and lectures.

Al-Kindi has been described as "the marvel of his age". The breadth of his interests and the knowledge he gathered and then wrote on are so extensive as to justify this description. He is rightly considered the first of the Arab philosophers and as the man who attempted to reconcile the science of the ancients with the teachings of Islam. His philosophy was overshadowed in the Islamic world, it is said, by the work of those who followed him, but he retains his position as "Philosopher of the Arabs" by virtue of his being the first who lit up the road for those who followed. He held that "truth

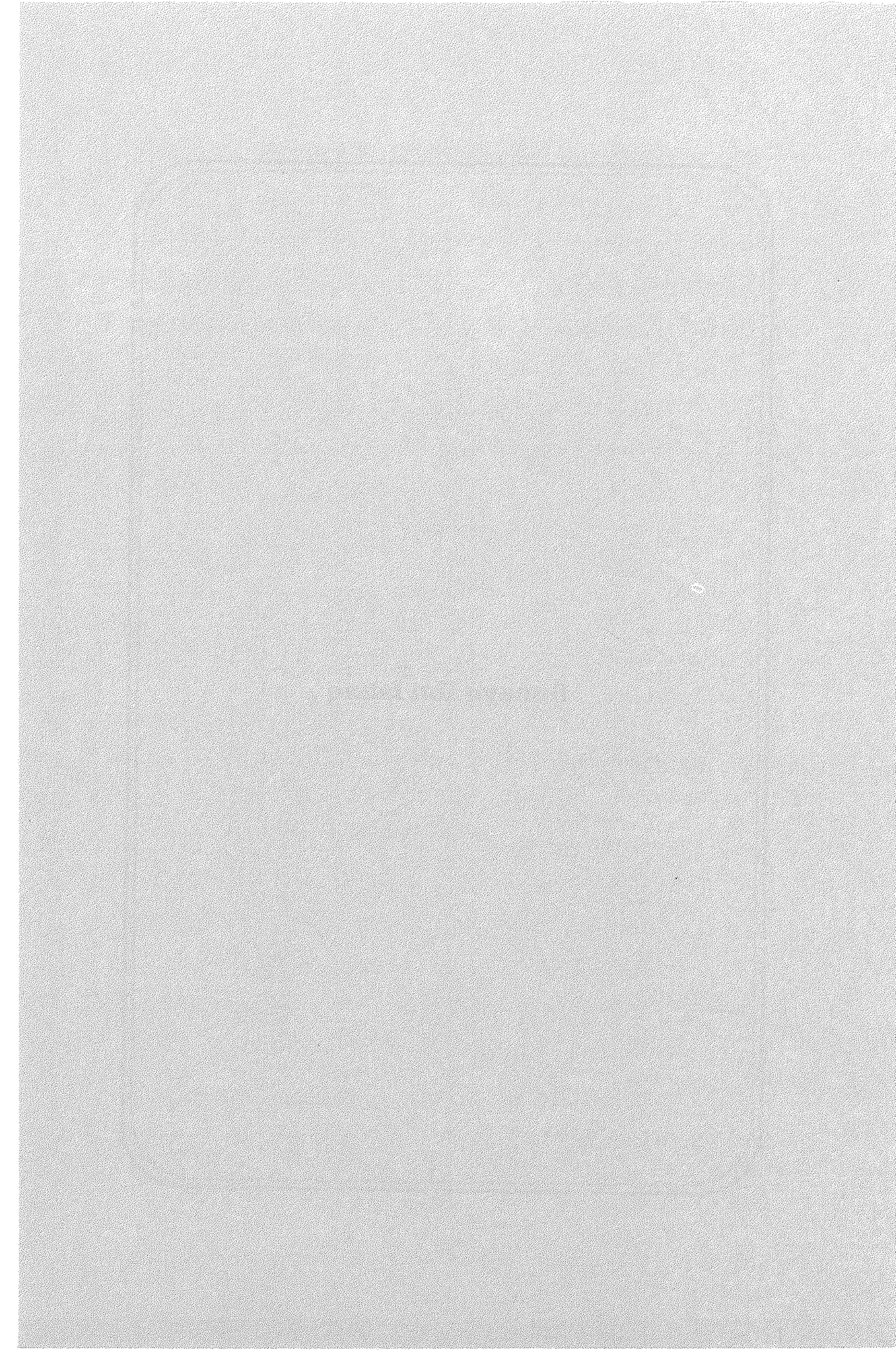
must be acquired from wherever it comes", and held true to this principal throughout his life. As Ivry writes, "he was at or near the beginning of a philosophical movement that remained vital in the Islamic world for some centuries thereafter". One cannot read of his life and times without feeling the elation and anguish of one outstanding man's triumphs and trials and sensing the adventure and the glory that must have suffused this golden age.

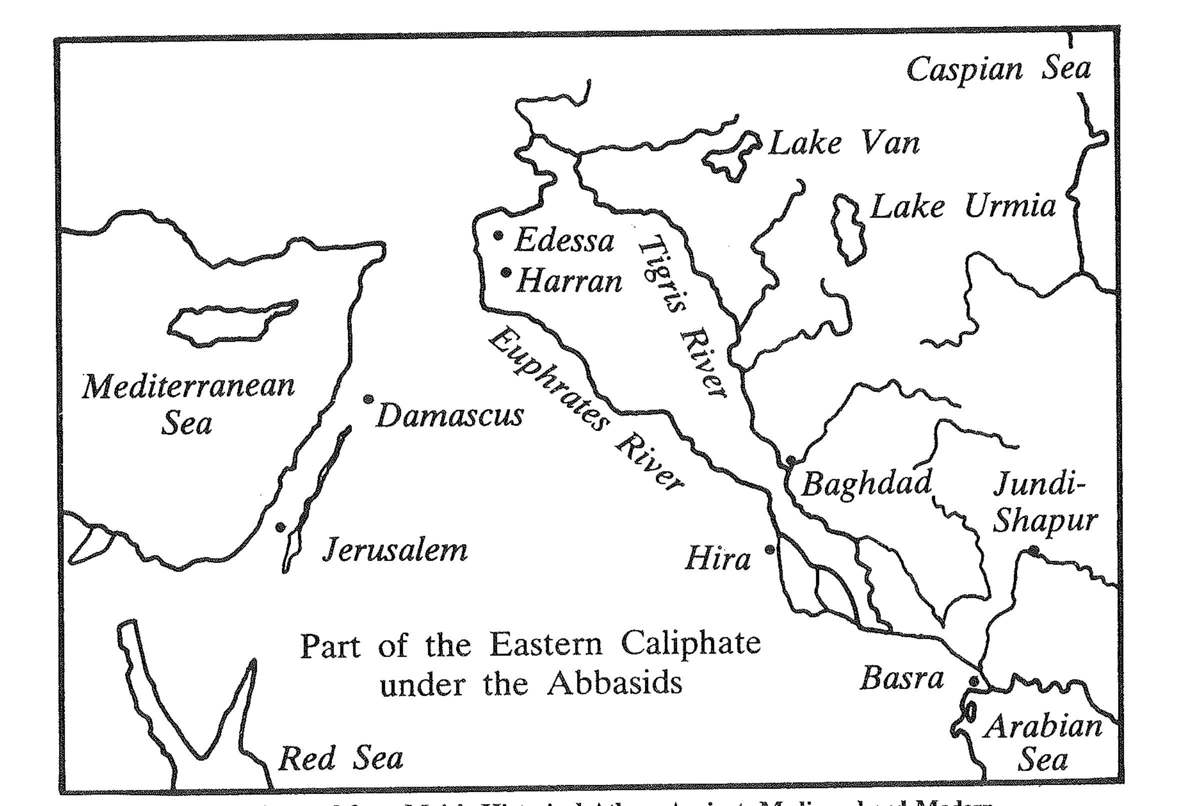
Acknowledgement

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Hunayn Ibn Ishaq





Adapted from Muir's Historical Atlas - Ancient, Mediaeval and Modern.

Hunayn Ibn Ishaq (JOHANNITIUS):

[809 - 873 A.D.]
"The Erasmus of the Arabic Renaissance"
(Abu Zayd Hunayn ibn Ishaq al-Ibadi)

"Hunayn is the greatest figure of the ninth century. One could even state that he was one of the most splendid intellects and one of the most beautiful characters to be met with in History. The marvellous extent of his works, their variety, their superiority, their importance and the tribulations he suffered so nobly at the beginning and during the course of his career all provoke interest and sympathy. If he did not create the renaissance movement in the East, no one else took so active a part in it or was as sure and as productive.

(translated from Julien Leclerc - Histoire de la Medecine Arabe)

Even in a cameo sketch as brief as this must necessarily be, one cannot write about the life and works of Hunayn ibn Ishaq without first outlining some of the events which preceded his birth and which laid the seeds for the subsequent rescue of Greek knowledge by the Islamic world. The schism in the Christian world had led to the expulsion of Nestorian Christians from Byzantium to Edessa and other places in Syria during the second half of the fifth century (Gregorian calendar), and further aggressive acts of the Church remaining in Byzantium eventually forced many of the intellectuals among the Nestorians to move further away to Jundi-Shapur, which they hellenised. Jundi-Shapur itself had been founded by the Sassanids to outshine Antioch. It was already a centre of knowledge when they arrived, but they made it a centre of Greek knowledge par exellence. Not all of the Nestorians fled to Jundi-Shapur, however, and Hunayn came from a group which had stayed behind

in what would now be called Iraq. The Nestorians formed the prime source of knowledge (in the form of translated and untranslated Greek writings) and of expertise (in the form of translators) upon which the Abbasids were to draw when they sought to incorporate the knowledge of the Ancients within the burgeoning Empire of Islam. A lesser, but still important source of this knowledge was to be found in the city of Harran. The people,of Harran were star worshippers, heathens whose beliefs stimulated them to make a serious study of mathematics and astronomy. It was in these fields rather than that of medicine that their translators did most of their later work at Harran, which lay west of the Euphrates very close to Edessa and what is now the border between Turkey and Syria. These people were known as Sabians. Under the caliph, al-Mutawakkil, Thabit ibn Qurrah headed a team of Sabean translators. The Jews also contributed translators who took part in the Abbasid enterprise.

Although some first efforts at translating the works of the Greeks had been made at the behest of Khalid bin Yazid (born about 665 A.D., died 704 A.D.) when Islam had expanded into Egypt, it is the Abbasids who were really the driving force in the era of translation. Al-Mansur invited the Nestorian Jurjis bin Jibra'il bin Bukht Yisu to come to Baghdad in 765 A.D. In the (translated) words of Julien Leclerc, "Jurgis came to Baghdad, and his presence was the spark that kindled the fire of learning in the Islamic world." [Jurgis was a member of an eminent Nestorian family. Two of his descendants will also be mentioned in this article. The first, who helped Hunayn ibn Ishaq and was one of his teachers, was the grandson of Jurgis. His name was Jibra'il bin Bukht Yisu. The second, who did Hunayn no good at all, was a great grandson of Jurgis. His name is Bukht Yisu bin Jibra'il] The work started under al-Mansur was continued under the caliph Harun al-Rasheed (ruled 786-809 A.D.), who founded a library, the 'khazanat al-hikma'.

This library was incorporated into the 'bait al-hikma' (House of Wisdom) which was established by the caliph al-Ma'mun (ruled 813-833) in 830 A.D. It was intended that it deal with the translation of Greek texts which the Arabs had obtained from the country of Rum (Asia Minor). There were two observatories attached to it, one in Baghdad and one in Damascus. Sourdel (Encyclopaedia of Islam) states that it was established in imitation of the institutions the Arabs discovered in Jundi-Shapur. It is uncertain whether this House of Wisdom survived the orthodox reaction during the later reign of al-Mutawakkil (847-861). Hunayn nevertheless did a good deal of his work under this ruler. The House of Wisdom was above all a school of translators, and it dealt with material from all the sources of knowledge accessible to the Arabs. It was also a centre of research, but does not seem to have played any role in teaching.

Before we finally move on to Hunayn, it would be helpful at this point to interject a short note on an eminent translator who was active before him under Harun al-Rasheed and who was later to be one of his teachers. Juhanna bin al-Massawayh (born 777, died 863 A.D.) came from an illustrious family. He was a man of great intelligence, but he was also an ill tempered man who was so proud of his roots in Jundi-Shapur that he seemed to feel that only those who had come from there had any right to be physicians. Nevertheless, he served in very high positions under several caliphs, and Sleim Ammar (Médecins et Médecine de l'Islam) states that he was the dominant figure in the first stage of the era of translations. As a writing physician, he also produced treatises on fever, phlebotomy, leprosy, hygiene, gynaecology and dietetics as well as a pharmacopoeia. He is credited with the first Arab work on ophthalmology. He also took the first steps towards the organisation and regulation of the Arab medical profession.

There can be no argument about who was pre-eminent in the second stage of the era of translations. It was without doubt Hunayn. Abu Zayd Hunayn ibn Ishaq al-Ibadi, who was known in the West as Johannitius Onan and Humainus, was the son of a pharmacist. His birth is usually dated at 809 A.D., although 792 and 808 have also been suggested. He was born in or near Hira, which was a town on the Euphrates, about 150 miles south of Baghdad. It is said that the townspeople of Hira were given the name, al-Ibadi, because they had been known for their subservience to Persia despite the fact that they were Arabs. Most of the literate people of this town were bilingual in the time of Hunayn, speaking both Syriac and Arabic; curiously, it was also thought that they had originally come from Boeotia, a region of Greece lying north of Athens. Hunayn's early medical education may have taken place at Jundi Shapur; he arrived in Baghdad when he was only 17, and attached himself to Yuhanna bin Massawayh, probably serving as a dispenser of drugs and a general book-keeper. Sometime during this apprenticeship, he met with the first great trial of his life, and this happened, it is said, because of his habit of asking many searching questions of Yuhanna. The latter, who was renowned for his impatience and sharp tongue, turned on Hunayn on one occasion and cried, "What have the people of Hira to do with medicine? Go and change money in the street!" Hunayn was reduced to tears, and left his mentor with his life in disarray.

Little is known of Hunayn for the next few years except that he wandered about in Greece and perhaps Asia Minor intent upon mastering the Greek language. He may also have visited Alexandria during this period. One day, two years or so after he had left Baghdad, a friend and fellow student of his, a certain Yousef, came across a heavily bearded man reciting Homer in the streets of Baghdad. Hunayn was recognised by Yousef, and he begged his friend not to tell others of his presence; he did not want to return to

his chosen work in Baghdad until he had perfected himself. It is known that he studied Arabic in depth in Basra.

When he finally considered himself ready, he returned to Baghdad and showed his translation of Galen's work on anatomy to Jibrai'il bin Bukht Yisu, who was astounded at its perfection. Another account describes Jibra'il's admiration for his translation of 'De Differentiis Febrium' and 'De Typis Febrium'. He also sent Juhanna bin al-Massawayh his translation of the 'Aphorisms' of Hippocrates. Juhanna realised what an error he had made in dismissing Hunayn, and they were reconciled.

At this point, Hunayn's career blossomed. He was recommended to the caliph by Jibra'il, and he became chief of the House of Wisdom. He may have been attached to an expedition sent out by al-Ma'mun to search Greece for manuscripts which could be translated in Baghdad. At any rate, al-Ma'mun charged him with the task of translating the Greek works into Arabic, and revising works which had already been translated. The results of his labours were exchanged for their weight in gold.

He did not restrict himself to translating only from Greek to Arabic. In fact, he is credited with more translations from Greek to Syriac than from Greek to Arabic. This is because he made his translations to suit those who commissioned them. The Syriac translations would for the most part be done on behalf of the Nestorian Christian community in Baghdad. For his Arab clients, he would translate into Arabic. He was not, however, alone in this task. The total number of translators amounted to about one hundred. Chief amongst these were, besides Hunayn, his nephew, Hubaysh, his son Ishaq and his pupil Isa bin Yahya. The most important among those who commissioned translations from Hunayn were Juhanna bin al-Massawayh and Jibra'il bin Bukht Yisu among the Christians and Banu Musa (the sons of Musa bin Shakir) and, naturally, al-Ma'mun among the Muslims.

When Hunayn began his work in translating into Arabic, the Arabic language did not have either a vocabulary or a syntax designed to accommodate medical terminology. His knowledge of Arabic was very profound, and he developed the necessary scientific terminology and shaped a syntax suited to the ideas and concepts of medicine and science in general. This in itself has been described as a "priceless performance".

His approach to translation was, according to modern linguists, a very 'modern' one. He would not content himself with a single manuscript. Instead, he gathered up as many versions of the article as he could lay hands on, and he did not begin the work of translation until he had collated all of them and come up with what to him was the most faithful rendition of the subject of the article. This he then translated, not word for word (as the later translators from Arabic to Latin were inclined to do), but according to the sense of the language used. He took care not to embellish or to change what was written in Greek. Those who have commented on his work praise him for his ability to communicate the true meaning of the texts on which he worked, and they attribute this ability to his knowledge in depth of Greek, Arabic, Syriac and Persian. Cyril Elgood has written, "At the very moment when the liberality of a caliph offered unlimited means to ensure the scientific pre-eminence of Baghdad there was in Hunayn a man to hand who would give to the city that pre-eminence, and that not to Baghdad only, but to the whole Islamic world".

Although Hunayn's second career as a physician is now judged to be less important than his role as a translator, he was court physician to al-Ma'mun and al-Mutawakkil, and on the basis of a work of his entitled, "Questions", he was appointed chief physician of Baghdad according to Ibn Abi Usaybi'a. Certainly, his abilities in this direction saved him from a dire fate during the reign of al-Mutawakkil.

When al-Mutawakkil became caliph, and although he was extremely orthodox and intolerant of Christians and Jews, he was impressed by the reputation of Hunayn, whom he called to court and treated with great honour. However, al-Mutawakkil appears to have been a less than admirable man who was suspcious of all who might challenge him. One day, he summoned Hunayn to him and commanded him to prepare a cup of poison which he meant to use to rid himself of someone or other who was troubling him. Hunayn refused, and he was thrown into prison where he is said to have spent a year, working as best he could on his translations. When this period had passed, al-Mutawakkil called him before him once again and this time he threatened Hunayn with death if he did not prepare the poison. Hunayn, refusing once again, said, "I have skill only in what is beneficial. I have studied naught else...My religion commands me to do good to my enemies, how much more to my friends. My profession is founded for the use of my fellow men and only for their welfare. It is incumbent upon a physician therefore never to prepare a noxious drug". Al-Mutawakkil seems to have decided that Hunayn could not be forced to do his bidding. Perhaps he also realised that his physician was more valuable to him alive than dead, since by this time Hunayn's reputation was immense. At any rate, the caliph reassured him by stating that what he had done to him had simply been a test, and he reinstated him.

One would think that a test of this sort was just about all Hunayn required, but more was to follow. He seems to have roused the ire of his Nestorian Christian brethren. One Bukht Yisu bin Jibra'il, together with Isra'il bin Zakariyya al-Tayfuri conceived a plan designed to destroy Hunayn. When the trap was laid, al-Mutawakkil summoned Hunayn before him and showed him a picture which, from what al-Mutawakkil said later must have been of the Virgin Mary and the baby Jesus. He asked Hunayn his opinion of the picture, and Hunayn replied, "God forbid that I

believe that He (Jesus) could be pictured". Al-Mutawakkil then drew from Hunayn the opinion that such a picture was of no value whatever. He asked Hunayn if that meant that he would be willing to spit on it, and when Hunayn replied in the affirmative, asked him to do so. The trap was then sprung. The head of the Nestorian Christians in Baghdad, the "Catholicos", was asked his opinion of what had happened, and he stated that if he had the power to do so, he would bar Hunayn from the temples and excommunicate him until he had sincerely recanted and atoned for his blasphemy. Once again, Hunayn was imprisoned. This time he endured six months detention in the house of the "Catholicos". In addition, he was flogged a hundred times, and all the books he had collected during his travels were taken from him. His career seemed certainly ended at this point, when fate took a hand in the affair. Al-Mutawakkil became ill, and eventually it transpired that only Hunayn was able to cure him. His fortunes were reversed once again. All that had been taken from him (except his time) was restored to him. The villains of the piece, Bukht Yisu bin Jibra'il and Isra'il bin Zakariyya al-Tayfuri were both fined 10 000 dirhams, and the money was given to Hunayn.

Little is known of the family of Hunayn, except that he had at least three sons. One, Ishaq, joined him in the translation work (he concentrated on philosophy for the most part). Another, Da'ud, became a clinician of note. He had a third son, Wakil, who seems to be known only by his name.

In his later years, Hunayn suffered a stroke which left him paralysed on his left side. He died in 873 A.D. (some claim his death occurred in 877).

In all, Hunayn translated more than 100 works by Galen, Hippocrates, Dioscorides, Oribase, Paul of Aegina, Aristotle, Plato, Euclid and many others covering not only medicine but all the other disciplines on which these and other Greek authors had

written, including those of mathematics, astronomy, philosophy and religion. Besides his direct translations, he produced commentaries, treatises and pamphlets, and the sum total of all his works approached 200. He translated the Old Testament into Arabic, and he produced a Greek-Syriac dictionary.

The range of subjects on medicine specifically was as extensive as was that of the authors he translated. He wrote on food, on the differences between food and medicines, on the conservation of teeth, on baths, on pestilential waters, on the anatomy of the alimentary system, on the pulse, on urine, on genetic problems and birth defects, on dropsy, on sexual hygiene, on ophthalmology, on the interpretation of dreams, on biliousness, on the epileptic child, on the treatment of acute illnesses and so on.

In other fields, he wrote on the action of the sun and moon, on meteors, on the saline properties of the sea, on agriculture, on grammar and logic, on geometry, on spheres and cylinders, on astrology, on politics, on plants and on the Greek language.

Many of his translations were cooperative efforts, with Hunayn alloting sections of a given work to his assistants. Most often, the final translation was checked and revised by Hunayn himself. The 16 books of Galen, for instance, were not all translated by Hunayn. He did the translation of three quarters of them, and his nephew, Hubaysh, did the rest.

Hunayn was very critical of other people's work, and just as critical of his own. Sleim Ammar notes the following comments of Hunayn himself on a work, 'De Sectis' by Galen, which he had done previously. "I translated it when I was 46. Hubaysh asked me to correct it." Hunayn then acquired further Greek manuscripts, which had become available subsequent to his first translation, and corrected his original translation. As always, he abstained from all temerity, all changes and additions in the work.

Of his own original work, the most important pieces are considered to be 'al-Masa'il fi at-Tibb' (Questions on medicine), 'Ten treatises on the eye' and 'Kitab al-Mawludine' (Book on deliveries) in which he described congenital deficiencies and birth defects, and wrote about prematurity and dysmaturity.

His specialty was the eye, and his ten treatises on the eye were gathered together at the request of Hubaysh. It is the oldest known systematic manual of ophthalmology. The subjects of each treatise, according to Sleim, are:

1. *Anatomy of the eye*
2. *Description of the brain*
3. *The optic nerves and vision*
4. *Galen's works on nosology, aetiology and symptomatology*
5. *Ocular diseases*
6. *Diseases of the conjunctiva*
7. *Properties of simple medicines*
8. *Remedies*
9. *The treatment of eye diseases*
10. *Description of how the book (above) came into being, and the preparation of compound medicines.*

The collection also contained 5 diagrams of the eye; they are the first such known. Cyril Elgood notes that there was an eleventh treatise dealing with operative treatment. Writing about one hundred and fifty years later, Ali bin Isa, who specialised in ophthalmology, remarked that Hunayn had "gathered up all the blossoms of all the works produced by the prominent physicians who wrote before and after Galen". His work on this subject stimulated ar-Razi.

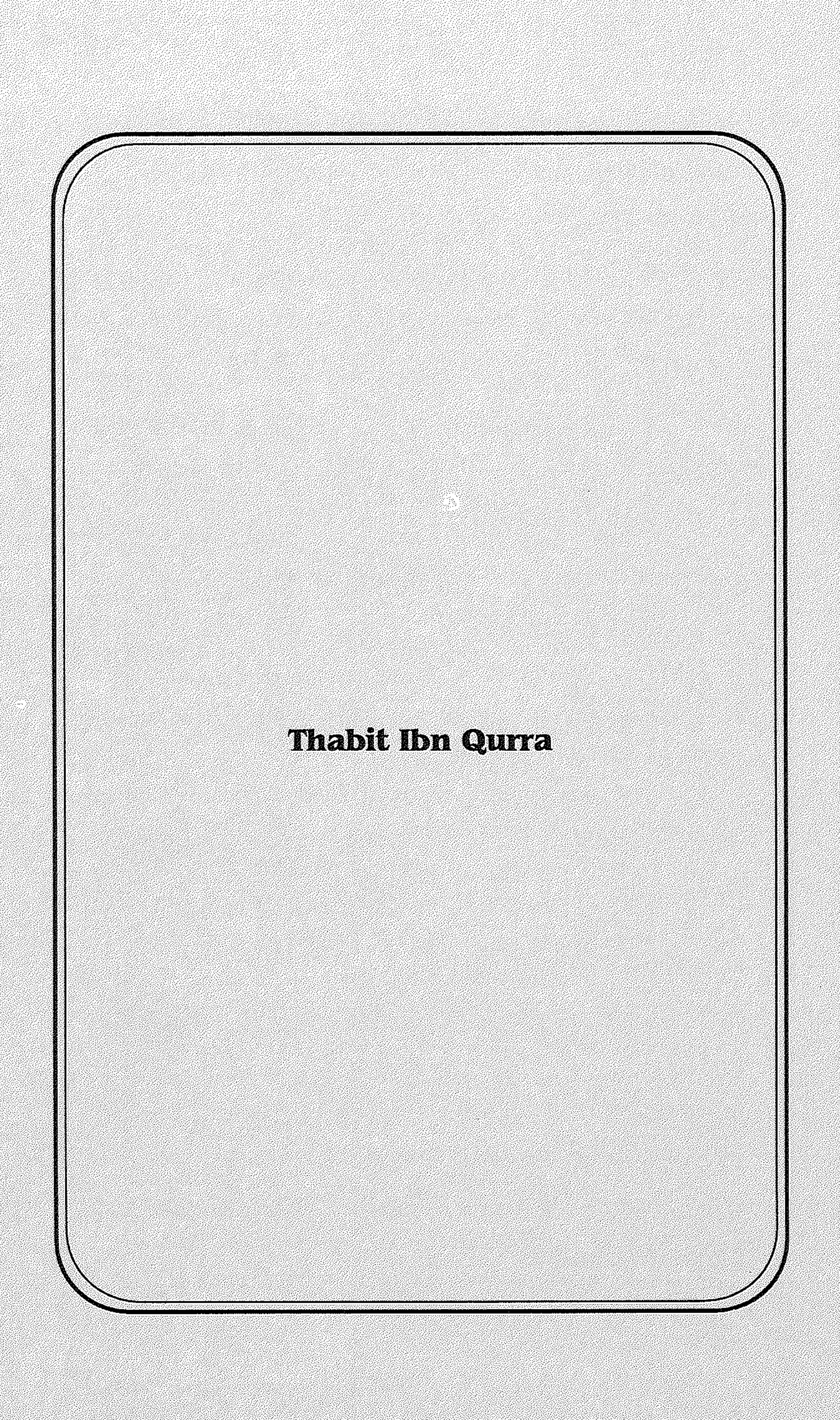
His original works included commentaries on and summaries of the works of Galen and Hippocrates. One of these, 'Isagoge Johannitii ad Tegni Galeni' (in artem parvem Galen), was a review of the Galenic system of medicine, and it was used in Europe in the

Middle Ages as an introductory medical work. Latin versions were printed in Leipzig in 1497 and in Strasbourg in 1534.

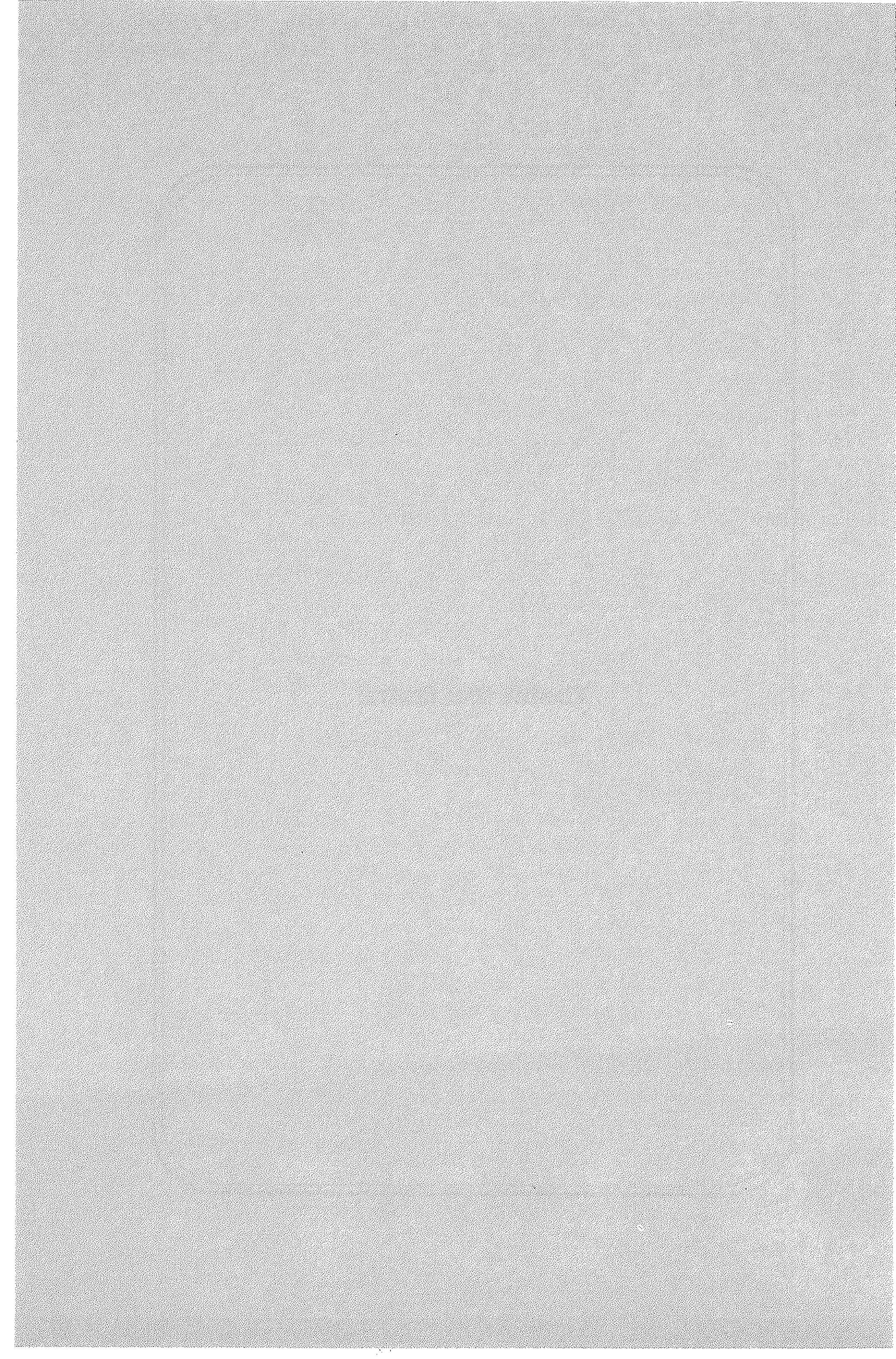
His 'Questions on medicine' was written in a manner popular among the Nestorian Christians of the time. When they sought to educate others on their religion, they produced pamphlets with a series of questions and answers, and Hunayn appears to have adapted this to the teaching of medicine.

At a certain age in the development of European Medicine, some of the texts which derived from the Arabs were criticised very harshly for their having departed from the true meaning of the Greek originals. Such criticisms were directed at the Arabs, but this was quite unfair in most cases, since the reader was studying a bad Latin translation of an Arabic text. In fact, the European reader might on accasion be assessing a Latin translation from Hebrew which in turn had been translated from the Arabic. Indeed, this Arabic translation might derive from the Syriac rendition of the original Greek !

If one were to sum up the accomplishments of Hunayn ibn Ishaq in two or three sentences, one might begin by stating that he used his profound knowledge of Arabic to conjure out of its essence an Arabic way of describing the concepts and particularities of scientific knowledge in general and medical subjects in particular. He will be remembered in perpetuity for the voluminous output of Arabic and Syriac translations of Greek writings; it is not over-stating the case to note that Arabic Medicine is based on these works. I hope he will also be remembered for his courage, his intelligence and his humanity.



Thabit Ibn Qurra



Thabit ibn Qurra, Sinan ibn Thabit, Harran and the Pseudosabians

(Abu al-Hassan Thabit bin Qurra bin Marwan bin Thabit bin Karaya bin Ibrahim bin Marinus al-Harrani, and his son, Abu Saieed Sinan ibn Thabit ibn Qurra)

"Another group of translators came from the city of Harran, where paganism persisted up till the twelfth century A.D. It was also called Hellenopolis because of the high degree of Greek culture which peermeated this city for such a long period. The inhabitants were called Sabians, although they had nothing in common with the Sabians of Chaldea. The best of these, where the field of medicine is concerned, were Thabit ibn Qurra and his sons, Ibrahim and Sinan." [translated] (from Sleim Ammar: Médecins et Médecine de l'Islam: de l'aube de l'Islam à l'age d'or)

Before we discuss Thabit and his son, Sinan, two aspects of the background must be clarified, since they may be confusing to those who are unaware of them. They are the city of Harran, and the Sabian religion.

Harran

To the Greeks it was Karran (*χαρραν/καρραν*), to the Romans it was Carrhae and to the Arabs it was Harran (حران). The fathers of the Christian Church called it Hellenopolis, and they termed it, 'the Heathen city' because of the pagan beliefs of its inhabitants (Encyclopaedia of Islam). Situated on the river Djullab close to the upper reaches of the Euphrates, and now in the south of Turkey, Harran is presently a ruin. It is a very old city - old enough to be reputed to be the birthplace of Abraham. It is certain that he spent some time there when he left Ur. Harran was the centre of the worship of Sin, a 'god'

associated with the moon (a picture taken from the air shows the eight-gated walled city to be ellipsoid, or roughly moon shaped, about four kilometres in circumference; the picture belonged to the late professor D. S. Rice), and it became a centre of star worship generally and a place to which pagans made pilgrimages. The inhabitants of Harran are said to have regarded the planets as powerful 'gods' who could be persuaded to reward their supplicant worshippers by acceding to their prayers. It was an original centre of the study of alchemy, and Arab alchemists are said to have drawn upon this knowledge later on. In the time of Alexander the Great (356 B.C. - 323 B.C.) it also became a Hellenistic centre, and it retained this reputation as a source of Greek knowledge during the Islamic era. Indeed, so basic was the city's connection with Hellenic culture that its educated elite were likely to be more proficient in Greek than in Syriac or Arabic. The city surrendered peacably to Iyadh ibn Ghanam in 640 A.D., and was therefore within the orbit of Islam from the earliest times. In the time of the Caliph, Omar II, a school of medicine was transferred from Alexandria to Harran. At the height of its existence it was a busy city with imposing bazaars, a great mosque, a 'Sabian' temple, a strong citadel and a small but famous mausoleum dedicated to Sheikh Hayat. It became the capital of the Umayyad Empire under Marwan II. As the centre of Marwan's resistance to the Abbasid advance, it became a target of the latter, and Marwan's palace there was sacked when they defeated him.

Although many of the Harranians must have turned to Islam following its original surrender (it became a stronghold of the followers of the orthodox Muslim, Ibn Hanbal [780 - 855 A.D.]) some inhabitants would seem to have clung to their original religious beliefs with some tenacity since, some two hundred years later, when the Caliph Al-Ma'mun passed through Harran in 830 (on his way to do battle with the Byzantines) he summoned the

dignitaries before him, and was amazed at their long hair and strange clothing. When he asked them which of the "People of the Book" they were, they could not give him a satisfactory answer. As all Muslims will know, the "People of the Book" are those named in the Holy Quran as people whose religion derives from a written revelation which preceded the Quran. They are the Jews, the Christians and the Sabians, and they are accorded a recognition not given to adherents of other religions. Al-Ma'mun was puzzled by the answer they gave him, and demanded to be informed plainly which of the "People of the Book" they were. He threatened them with dire punishment should they not be in a position to tell him this when he returned from battling the Byzantines.

Of course, the pagans among the inhabitants of Harran were in no position to supply him with this information, since they were star worshippers [according to the Encyclopaeda Britannica, they were "Syrian heathens, star worshippers versed in astrology and magic. In their temples, the planetary powers were propitiated by blood offerings, and it is probable that human victims were occasionally sacrificed as late as the 9th century of our era."] . Their worshipping of the stars had made excellent astronomers, mathematicians and astrologers out of them, but it had not prepared them for the conundrum which now faced them. They therefore sought the advice of an Islamic legal expert. When he had considered their problem fully, he wisely advised them to claim to be Sabians. This religion was not very well known to the Arabs (unlike Christianity and Judaism), and it was felt that the Harranians had the best chance of survival if they chose this least known of the three, which would therefore least likely be the source of difficult questions from Al-Ma'mun ! In the event, this proved to be correct, and they were left in relative peace. Certainly, their men of learning were invited to assist the Islamic search for knowledge and many of them came to Baghdad for this purpose. Of those who did so, Thabit ibn Qurra

was the most oustanding. By the eleventh century, however, the last 'Sabian' temple had been destroyed. Later on, in the thirteenth century, the great mosque of the Muslim inhabitants as well as other buildings in the city were destroyed. This happened at the hands of Mongolian invaders who even walled up all the gates to the city and left it deserted.

Sabians and Pseudosabians

The Encyclopaedia Britannica describes the true Sabians as "a semi-Christian sect of Babylonia, the Elkasaites, closely resembling the Mandaeans or so-called 'Christians of St. John the Baptist', but not identical with them." As such, they possessed a 'written revelation'. It can be seen, then, that the inhabitants of Harran who called themselves Sabians were indeed quite different from them. However, this fact was not pointed out in much of the earlier information gleaned about them, and it certainly had not been revealed to Al-Ma'mun. To distinguish the two, it is now common to call the Harranian pagans "Pseudosabians". Not all these Pseudosabians practised the more extreme customs mentioned in the Encyclopaedia Britannica. Indeed, Thabit ibn Qurra, whom we will now discuss, was forced to leave Harran because of his contrary opinions on their religion, and his son, Sinan ibn Thabit embraced Islam in his later years.

Thabit ibn Qurra

Abu al-Hassan Thabit bin Qurra bin Marwan bin Thabit bin Karaya bin Ibrahim bin Marinus al-Harrani was born in the year 843 A.D. (836 A.D. and 834 A.D. have also been suggested) in the city of Harran. His family must have been influential because he is said to have inherited a large fortune. He is also said to have originally been a tax collector, who held heretical views on religion which so offended his co-religionists that he was forced to recant,

leave Harran and move to Kafratusa, near Baghdad. Subsequently he met and was befriended by Mohammed ibn Musa, who met him as he (Mohammed) was returning from Greece to Baghdad. The latter was one of the three sons of Musa bin Shakir, an astronomer at the court of Al-Ma'mun (the sons, Mohammed, Ahmed and Hassan, were known collectively as Bani Musa). This was much to the advantage of Thabit, as the Bani Musa were very rich and held much influence at court. After Thabit had moved into the home of Mohammed, he was introduced to the court of the caliph, who was sufficiently impressed by him to give him a position among his astronomers. While employed in this way, he strengthened his knowledge in the fields of logic, philosophy, mathematics and medicine. He was a remarkable geometrician - reputedly the greatest of those using the Arabic language - who applied algebra to the solution of geometric problems (Selim Chehade cites Sedillot who claims he was the first to have done so). Eventually, he joined the famous House of Wisdom (Beit al-Hikma) which had been founded by Al-Ma'mun where he busied himself with that institution's translation work in the fields of medicine, mathematics and astronomy. He was an accomplished linguist, with a deep knowledge of Greek, Arabic, Syriac and Hebrew. He is said to have been without parallel in his time with respect to his knowledge and erudition. He is credited by Elgood with the writing of more than one hundred books. As a physician, his acumen is attested to by a story related by Ibn Abi Asaybi'a in which he is said to have observed a man skinning sheep in a slaughterhouse who from time to time would dip his hand into the body cavity of a sheep, and retrieve and eat some of the fat. He asked that he be informed when the man died. In due course, his death was announced. Thabit hurried to the man's home where his burial was imminent. Entering the death room, he felt and detected a weak pulse. After another man slapped the soles of the 'dead' man's feet on Thabit's

instructions, the corpse revived, and lived on for many years, unfortunately as a paralytic.

He became court physician to the caliph, Al-Mu'tazid (reigned 892 - 902 A.D.), who had a reputation of ferocious recalcitrance when subjected to unwelcome advice from his physicians (one of them died after being kicked in the stomach by Al-Mu'tazid, and another was executed for revealing state secrets he had picked up from dinner conversations with al-Mu'tazid). Amazingly, Thabit, a non-Muslim, had the unstinting respect and affection of this caliph to the extent that he alone was allowed to sit in Al-Mu'tazid's presence. Elgood explains this by recounting the tale of Al-Mu'tazid's earlier imprisonment by his father, al-Muwaffaq. At the time, Thabit was physician to the inmates of the prison. He made the acquaintance of the caliph-to-be because of this, and he then visited him three times a day, regularly, so as to relieve his anxiety and sustain his morale. This was never forgotten by al-Mu'tazid, who elevated Thabit to the position of court physician when he became caliph, and consulted him on all aspects of his government.

Writing later about his father, Thabit bin Qurra's son, Sinan ibn Thabit, related that the caliph, feeling a need for both physicians and medicines for those living in inaccessible rural areas of his lands, had ordered his father, Thabit to organise a system of travelling doctors whose duties were to move from place to place, carrying the necessary medicines. This was done. When Thabit learned that the mainly Jewish residents round about a village called Nahr Al-Malek were requesting this service, he queried the vizier on whether such a service should also be available to the "People of the Book", he was informed that it should be so.

Sinan also notes that when his father was caring for patients with diseases which required isolation, he took care to visit each daily to examine him or her and administer such drink and medicine as was deemed necessary, in keeping with the conclusions arrived at

by Ali bin Isa al-Jarrah, the vizier, who studied this aspect of disease and its treatment.

Thabit bin Qurra died in the year 901 according to most sources (Chehade gives the year 910, although he gives the same year as do most others by the Muslim calendar [288]). Elgood states that at his death he was 76. This would be true if he had been born in 834 (Ullman's date for his birth) and had died in 910 A.D. Although his stature does not approach that of Hunayn ibn Ishaq with respect to his output of translations, he was nonetheless an imposing figure who deserves his position of eminence in his time. Selim notes, "The death of Thabit deprived the court of al-Mu'tazid of a wise counsellor and an honest physician. He left behind to carry on the tradition two sons and his dearest pupil, Isa bin Asyad, the Christian, who had aided him in his translations."

Ibn Abi Usaybi'a lists a very large number of written works attributed to him. In medicine, he wrote on the pulse, on arthritis and gout, on transient jaundice, on measles and smallpox (before ar-Razi ?), on vision and perception in ophthalmology, on celibacy and chastity, on the movements of arteries and veins and on Galen's works on drugs, the anatomy of the uterus, premature babies and different types of diseases. His medical book, 'the Treasury' will be dealt with shortly. On other subjects on which he wrote, among those listed by Ibn Abi Usaybi'a are music, geometry, astronomy, the causes of mountain formation, the reason for seawater being salty, the mysteries of nature, the different types or levels of science, archeological ruins, the eclipse of the sun and the moon, the nature of the planets and their effects on humans and changes in the weather.

Cyril Elgood states that Thabit ibn Qurra's book, 'The Treasury' ('al-Zakhira') was written on behalf of his son, Sinan. Apparently Thabit's nephew later denied that Thabit was indeed the author, but it is now accepted that he was. Drawing on much of

what he had written elsewhere on medicine, it consisted of 31 chapters. Elgood notes that the subjects of the chapters are as follows:

Chapter(s)	**Subject(s)**
1	*prophylaxis and hygiene*
2	*asthma, or sub-acute attacks of disease*
3	*hair*
4	*beauty treatment*
5 - 19	*diseases in different parts of the body*
18	*diseases of women*
20 - 26	*guinea worm infection, diseases of nails and feet; tumours, poisons, fevers*
27	*plague and conditions of climate causing it*
28	*fractures, dislocations*
29	*milk*
30	*wine*
31	*sexual intercourse*

A propos the last chapter, Thabit has described a test for infertility which is said still to be used. The husband and wife are required to urinate upon young pumpkin or lettuce plants. Whichever one causes the plants to dry out is shown to be the sterile partner (Sezgin).

Selim cites one of the aphorisms of Thabit bin Qurra which also appears in Ibn Abi Usaybi'a: "Nothing is more harmful to an aged person than to have a clever cook and a beautiful concubine. For the former forces him to abuse food and he falls ill, and the latter entices him to the abuse of sexual intercourse which makes him grow older still. For the comfort of the body depends on the ingestion of small amounts of food and the comfort of the spirit is in the non-commital of sin, and the happiness of the heart is in the lack of worry, and the comfort of the tongue is in the non-abuse of talking". Like almost all of the eminent figures in Arabic medicine,

he was a strong proponent of moderation in all things. He was further distinguished by having a son, Sinan ibn Thabit, who was to shine as brightly as he had.

Sinan ibn Thabit

Ibn Abi Usaybi'a describes Abu Saieed Sinan ibn Thabit ibn Qurra as following his father, Thabit in his knowledge of science and in the practical applications of such knowledge. He was an outstanding practitioner of medicine. He had a genius for analysing problems and detecting the essential points of attack for their solution. He was a very effective organiser. All these attributes were put to good use by the caliphs he served.

Ibn Abi Usaybi'a has also described the events that led up to Sinan's embracing Islam. One of the caliphs he served, al-Qaher, was very anxious to see Sinan embrace Islam, and his insistence was so persistent and so coercive that he fled from him in the first instance before finally agreeing to change his religion. Having done, so, Sinan remained a Muslim until his death in about 946 A.D. (942 is also suggested).

His position in the public health services became an illustrious one. He became one of the two chief court physicians (Bukht Yishu IV was the other) and head of all the metropolitian hospitals. In addition to this he had authority over the hospitals in Makka, Medina and Tarsus. He took on the task of creating and organising new hospitals. When he began, the city of Baghdad had only 4 hospitals. Al-Jarrah built another one at his own expense and, in 918 A.D., a very rich lady had the Bimaristan-ul-Sayyida built and the caliph al-Muktadir himself founded the Muqtadiri hospital.

It was the caliph, al-Muktadir (908 - 932 A.D.), who gave Sinan what was possibly his most challenging task. Although Al-Muktadir introduced laws banning Christians and Jews from any profession excepting that of medicine and banking, Sinan became

physican to this caliph. Al-Muktadir wished to exercise some surveillance over those working in medicine in order to ensure that the public at large was served by men of competence. He therefore charged Sinan with setting up a system of control which was to begin with the examination of aspiring practitioners. Together with the vizier al-Jarrah, Sinan went on to raise the public health services to previously unreached degrees of excellence. Indeed, one thousand years later, many countries could profitably emulate what was attained by them.

It is perhaps pertinent to digress here to mention a development which made possible the provision of a new surface on which books could be written and notes could be made, which doubtless facilitated the setting up of a system which would require the use of considerable amounts of such a surface. The material forming the surface was paper. When Samarkand fell to Islam in 704 A.D., the Muslims obtained access to the Chinese technique of paper making. By the year 794 A.D. an Islamic paper factory was established in Baghdad. Other factories appeared elsewhere in places such as Tabriz. Two types of paper have been named, Ja'far and Nuhi.

Ammar notes that the system of surveillance embraced the following specialities:

pharmacists — *oculists*
perfumers — *surgeons*
syrop producers — *orthopaedists*
veterinary doctors — *dental surgeons*
phlebotomists — *psychiatrists*

Some 180 professionals took the examinations. Ammar has reproduced the description of the duties of the inspectors (muhtassibs) who supervised the same, from the treatise of Shayzari (XIIth century): [translation]

"It is the duty of the inspector to administer the oath of Hippocrates to all physicians and to make them swear never to

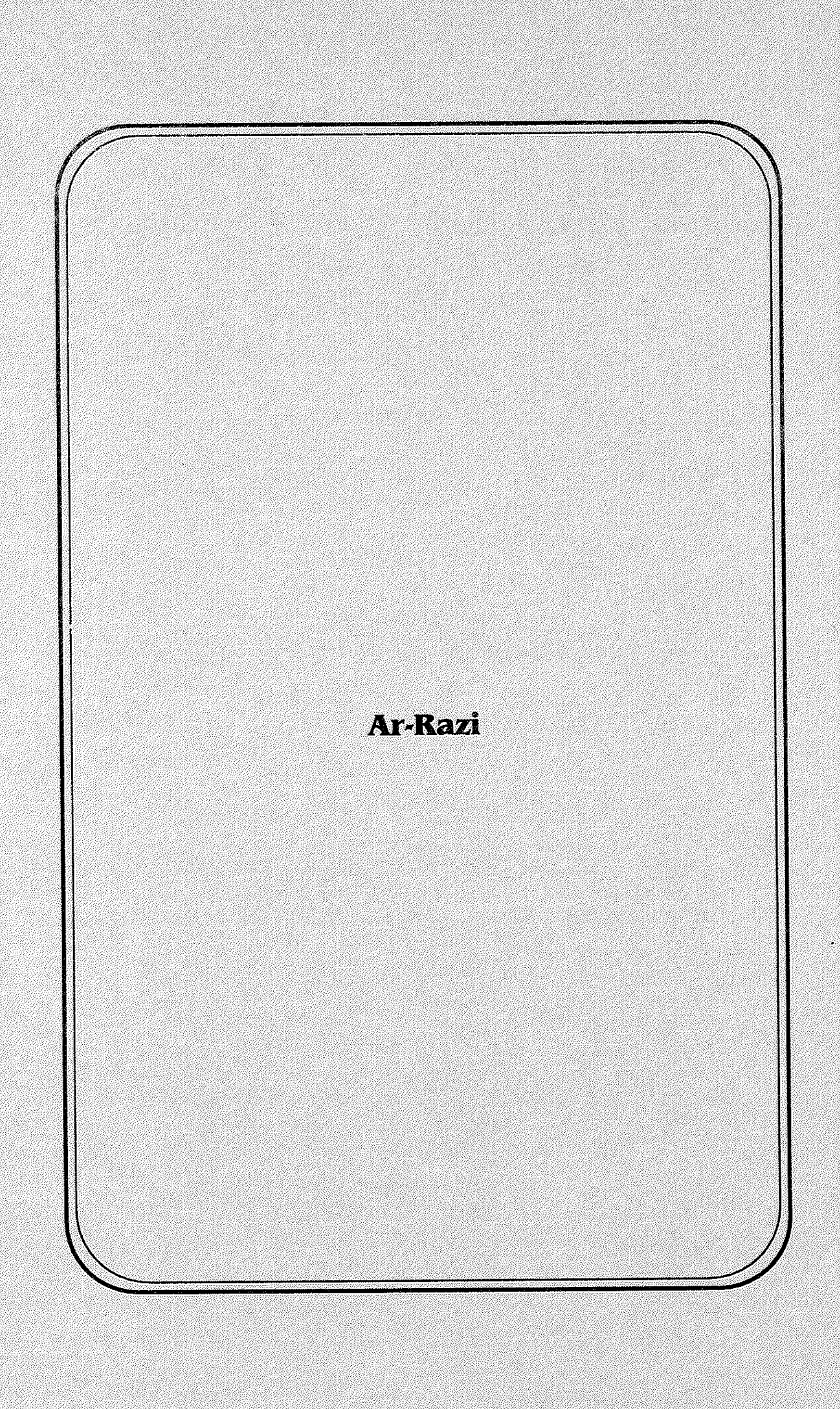
prescribe a harmful remedy to anyone, nor make up or prescribe a poison, nor prescribe for any woman any medicine which causes abortion nor for a man a medicine which causes sterility. They [Physicians] must avert their gaze from women in harems. When they enter the home of a sick person, they must divulge no secrets, nor must they remove veils".

Ammar goes on to quote further. Shayzari stipulates which instruments should be possessed by physicians, and he insists that the text to be used in examining candidate ophthalmologists should be the famous ten discourses of Hunayn ibn Ishaq. No orthopaedic bone-setter was allowed to practice before first demonstrating his knowledge of the sixth book of Paul of Aeginus on the reduction of fractures. Furthermore, such candidates must know the number of human bones and the shape and size of each so that he could proficiently reduce any broken bone to its original shape and position. Surgeons were required to study Galen on this discipline and have an understanding of the anatomy of the organs of the human body and the muscles, veins, arteries and nerves so as to avoid them in their operations.

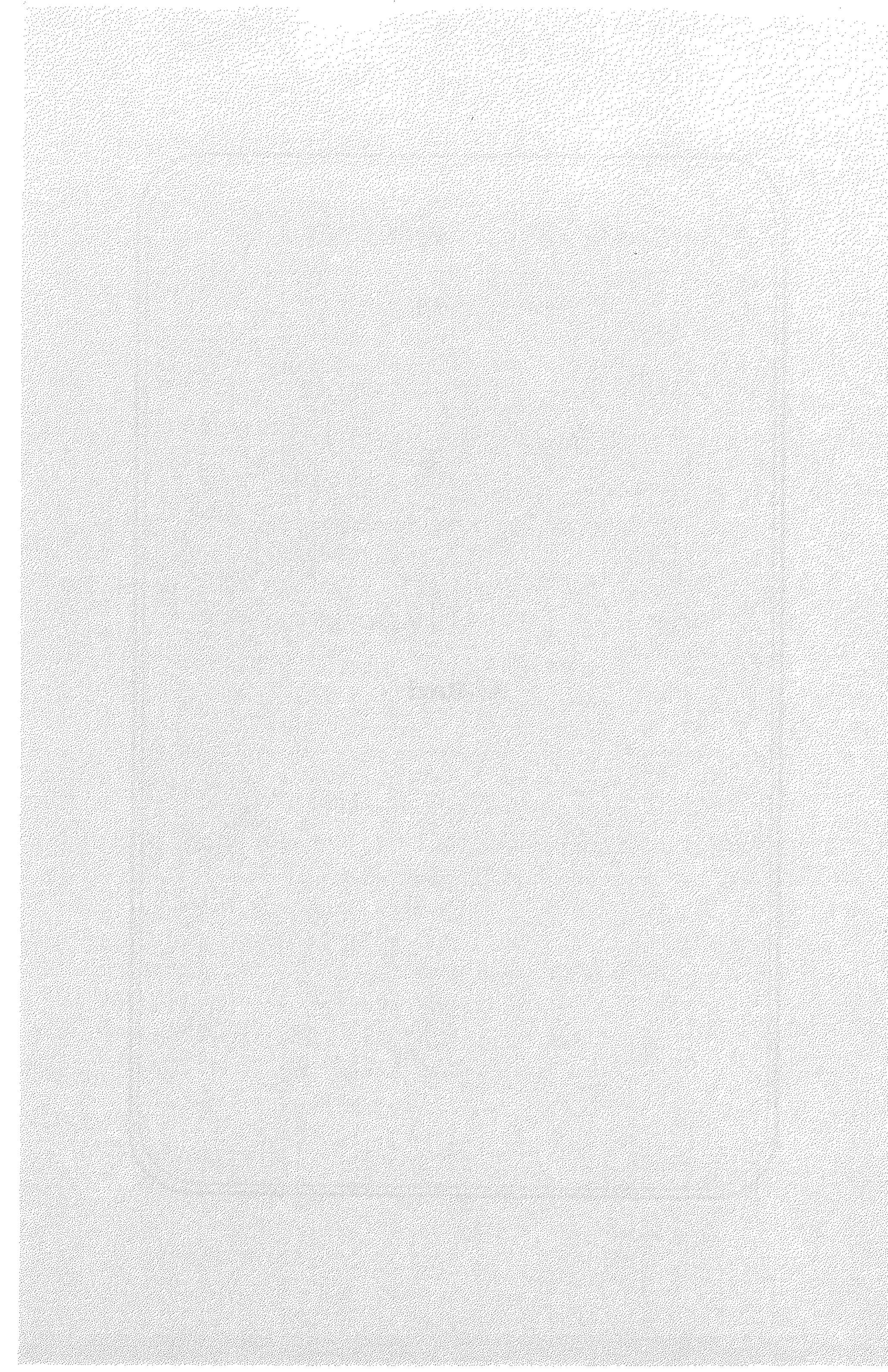
Ammar writes further about the inspectors (muhtassibs): The competence of physicians was regulated and controlled by the 'muhtassib', a sort of master of trades who surrounded himself in the exercise of his functions with the opinion of an appropriate committee for each discipline. Two eminent muhtassibs were Hunayn ibn Ishaq and Thabit ibn Qurra. Such men were chosen according to their abilities and irrespective of their religious affiliation. These regulating committees controlled not only physicians, but barbers, perfumers, artisans in cosmetics and eye care, druggists, herbalists and pharmacists. Indeed, regulation of the latter was not new. It had existed as far back as the time of Juhanna bin al-Massawaih (777 - 863 A.D.), when it had been instituted to control fraud in medical preparations.

When Sinan died, he left two sons who were both physicians. One of them, Thabit II, [907/8 - 973/976 A.D.] served the Abbasids during a period covering four successive caliphs. He became a head of a new hospital serving the centre of Baghdad at the age of 18, and he wrote a history of Baghdad covering his century. The second, Abu Ishaq Ibrahim [908/9 - 947 A.D.] became president of the Board of Examiners after Sinan's death.

Although Sinan was born in Baghdad, he must be considered the product of Harran, from where his father came and to which he owed his cultural background. His father, Thabit is remembered most for his written legacy, although he also played an important part in organising the medical services in the caliphate. What Thabit began, Sinan finished in magnificent style. The story of Sinan, together with that of the vizier, Ali ibn Isa al-Jarrah, and many unnamed helpers, is the story of the foundation of an effective, efficient, comprehensive, caring medical service, a jewel in the crown of the Empire of Islam and a lasting memorial to those who took part in such a glorious enterprise.



Ar-Razi





Ar-Razi (Rhazes)

[841 - 925 A.D.]
"The experienced one"
(Abu Bakr Mohammed ibn Zakariyya ar-Razi)

"When Galen and Aristotle are unanimous in the expression of an opinion, there lies the absolute truth, but when they are at variance it is hard to decide, and we should arrive at the proper course of conduct by ratiocination. The skilled and experienced physician will act upon the promptings of his judgement. (ar-Razi, from Donald Campbell's 'Arabian Medicine and its influence on the Middle Ages')

There seems to be considerable uncertainty about the year of ar-Razi's birth. He was, however, born in the ancient city of Ray, which is very close to modern-day Teheran. Donald Campbell gives the date of his birth as 841 A.D. Lucien Leclerc suggests the beginning of the second half of the ninth century and Cyril Elgood precisely dates it at August 27, 865. The exact date is probably not important, but the fact that it did occur around the year 850 is crucial, because it placed a man of genius in the right place at the right time for him to take full advantage of a remarkable series of events which began with Nestorius, the Christian patriarch of Byzantium from 428 to 431 A.D.

Nestorius was the chief of a sect with views on Christianity which were at variance with the orthodoxy of that time, and he was forced to leave Byzantium because of this. His followers established themselves in Edessa (Urfa in modern Turkey), but were persecuted by their Christian brethren to the extent that they were compelled to flee in 489 to Jundi-Shapur in Persia. There, they hellenised the medical school, and made it a safe refuge for the knowledge of Hippocrates, Aristotle, Galen and other Greek thinkers at a time

when Europe was in decline. The passage of Greek knowledge to this part of the world was helped a second time when the emperor, Justinian I, exiled what he termed the 'heathen philosophers' from Athens and Alexandria. They, in their turn, took refuge in Jundi-Shapur (The Alexandrian school later reformed under John the Grammarian, and the early phases of the growth of Islam brought it into the Arab orbit). Indian medical knowledge also came to Jundi-Shapur, carried there by physicians and others from India who were invited to live in this city. Ar-Razi refers to the Indian, Sushruta, in his writings. Sushruta lived in the sixth century B.C.

In the period before the Arab presence in this part of the world, much of the Greek knowledge then extant was possessed by Syrians, Jews, Sabians and the Nestorian Christians, and this they proceeded to translate into Syriac, which was a literary form of the semitic language, Aramaic. These Syriac texts subsequently became the source of much of the Greek wisdom eventually translated into Arabic.

At this point in history, the expansion of Islam brought the territory which included Jundi-Shapur into the Arabic sphere of influence. The enlightened behaviour of the Arabs at this time ensured the survival of much knowledge that would otherwise have been lost forever. All men of learning, irrespective of race or creed, were urged to continue their search for knowledge. In fact, during the times of the Abbasid caliphs al-Mansur, Harun ar-Rasheed, al-Ma'mun, al-Mutasim, al-Wathiq and, to a lesser extent, al-Mutawakkil, Nestorians, Syrians, Sabians and Jews were actively encouraged to transfer their homes to Baghdad, the Abbasid capital, to take part in the intellectual life of the city and to make Arabic copies of the books they possessed. Al-Mansur took great pains to extend the search for knowledge as far as possible, to the extent that he sent some 4000 Arabs to settle in China in 755 A.D. Harun ar-Rasheed established a hospital in Baghdad equipped with

all the facilities in it which were necessary for that age (Joseph Graziani notes that the first hospital in the Muslim world was set up between the years 705 and 715 A.D. under the Umayyad caliph el-Waled). Al-Ma'mun founded a House of Wisdom (bait al-hikmah) in which he installed a group of translators led by Hunayn ibn Ishaq al-Ibadi. Most of what was necessary for the efflorescence of Arabic medicine was available by about 850 A.D., the approximate date of birth of Abu Bakr Mohammed ibn Zakariyya ar-Razi.

Ar-Razi, known as Rhazes in Europe, was a man who excelled in many fields including alchemy, philosophy, botany, zoology, mathematics, physics, music and, in all its facets, the art and science of medicine. Medicine was not, however, his first love. In his early years, he had a passion for music; he played the lute and sang as well. From this he moved on to philosophy. In contrast to Ibn Sina, who had a genius for philosophy, ar-Razi was not particularly outstanding in this field according to the reports which have come down to us on this aspect of his life. He also studied literature and engaged in the writing of poetry. He was an alchemist of some note, and even wrote a book on the subject which he dedicated to an eminent person who first rewarded him handsomely for his efforts. Unfortunately, his benefactor had hoped and believed that ar-Razi was on the brink of success in transmuting base metals into gold. When this success was not forthcoming, he attacked ar-Razi and accused him of being a fraud and a charlatan. This attack was later considered a possible reason for ar-Razi's blindness (due to cataracts) which afflicted him shortly before his death. The existence of a book, 'A compendium of the Mansuri', which is attributed to Mohammed bin Zakarriyya ar-Razi, the money changer, is taken as evidence that at some stage in his life he earned his living as a banker.

At about the age of 30, he visited Baghdad and the Muktadiri hospital there. his visit is said to have changed the course of his life.

He took up the study of medicine (perhaps at Ray) and became the head of the hospital at Ray. He was later persuaded to return to Baghdad to take over the hospital there. At some time during his career, he was asked to choose the site of a new hospital in Baghdad, and he did this, it is said, by hanging bits of meat in various sections of the city and choosing as the site the part of the city in which the meat took longest to putrefy.

Just as Ibn Sina is renowned as a theoretician in medicine, ar-Razi is esteemed as a practitioner. He judged each case according to his knowledge and experience and was willing and able to differ with the ancients such as Galen when his judgement led him to a conclusion which demanded it.

An anecdote is told of ar-Razi which underlines his ability to observe astutely, render the proper diagnosis and provide an effective treatment. It is also a testimony to his courage! He was asked to examine and treat the amir al-Mansur of Bukhara. When he had ascertained the cause of the amir's malady, he explained to him that, to be cured, he must agree to certain conditions. The first was that ar-Razi be provided with a horse and a mule and these be among the finest the amir possessed. He also asked the amir to accompany him to a bath house outside the city, and to follow his instructions once they were there. This the ruler agreed to and he and ar-Razi found themselves at the entrance to the bath house with the horse and mule tethered just outside the door in the keeping of ar-Razi's servant. They entered, and ar-Razi proceeded to give the amir hot showers and a special drink. At this point ar-Razi went out (leaving the amir inside), dressed himself and went back into the amir's presence carrying a knife. He began to verbally attack al-Mansur in the most offensive manner, and ended his tirade by shouting, "If I don't kill you for a punishment, I am not Mohammed Ibn Zakariyya!" At this he quickly left the amir, (who was quite naturally in a towering rage), leapt upon the horse that al-

Mansur had given him, and accompanied by his servant, galloped off, not stopping until he had reached Merv on the other side of the Oxus, well out of the reach of al-Mansur. In fact, this treatment cured the amir, and he tried his best to entice ar-Razi to return to him. Ar-Razi was a prudent man, and he answered the amir with the following (as translated by E. G. Browne):

"May the life of the king be prolonged in health and authority! Agreeably to my undertaking I treated you to the best of my ability. There was, however, a deficiency in the natural colic, and this treatment would have been unduly protracted, so I abandonned it in favour of psychotherapeusis (ilaj-i-nafsani), and, when the peccant humours had undergone sufficient coction in the bath, I deliberately provoked you to increase the natural colic, which thus gained sufficient strength to dissolve the already softened humours. But henceforth, it is inexpedient that we should meet."

The tale may or may not be an apocryphal one (such stories were told of many of the eminent men of this age). It is nonetheless illustrative of the character and personality of ar-Razi.

Fuat Sezgin has quoted the modern views of Neuberger on ar-Razi (translation) "Ar-Razi was a follower of Galen in the theory of disease but in the practice of medicine he leaned towards Hippocrates in that after observing the course of a disease he decided on an individual therapy and chose simple rather than complex diets, drugs and hygienic measures. If a cure could be accomplished by diet, he gave no medicine: where simples sufficed he avoided compound medicines. He looked into the effect of climate, season of the year and weather generally and he took care that healthy air and a moderate temperature prevailed in the sickroom.

Ar-Razi developed the use of the seton. He was familiar with tonsillectomy and tracheotomy and procedures for correcting trichiasis, ectropion, entropion and for cataract extraction. He is

credited with the original account of smallpox and measles. He first used animal gut as a ligature. Medical chemistry had its beginnings with him. In one of his treatises, he describes the action of the pupil of the eye in response to light and dark.

He took great pains in the care of his patients, and was diligent and methodical in the training of younger doctors. He was a humane and sensitive man; his generosity led in fact to his passing his later years in some want. About 2 years before his death, ar-Razi became blind, but when a fellow surgeon offered to operate on the cataracts, he declined the offer. Some attribute this to the surgeon's being unable to satisfactorily answer a question ar-Razi put to him on the numbers of tunics in the eye but, in a second account, he was reported to have said he no longer wished to look out on a world of which he had seen too much and with which he was disillusioned. The date of his death was as uncertain as that of his birth. Al-Biruni places it at 925 A.D., but many other dates have been suggested, viz, 903, 923 and 932.

The written works of ar-Razi are said by Leclerc to number more than 200; those who visited him commented on the fact that he was always engaged in either composing or setting in order his writings. Certainly, many of these were monographs, letters or smaller works, but his output was nonetheless extraordinary.

His greatest work, which is said to be larger than Ibn Sina's Qanun, was produced posthumously. Indeed, it was probably never intended to be produced as such, since it is the compilation of notes and case reports which one Ibn al-Hameed purchased from the sister of ar-Razi after he had passed away. The compilation and editing was performed by ar-Razi's former students, and the completed work has been called al-Hawa (the Continent). It contains an enormous amount of information on all the medical writers who had preceded ar-Razi together with ar-Razi's assessment of their views and his own opinion where he differed with

them. As such, it is in itself a treasury of medical history. The 22 volumes treat the subject of medicine in a practical manner, beginning with localised illnesses from the head downwards and then moving on to generalised disease. He dealt with venoms and poisons generally. For each disease the causes, symptoms and treatment were discussed, and the views of other writers from Hippocrates and Galen down to Hunayn ibn Ishaq were compared with those of ar-Razi himself. A Latin translation was made by Farraguth in the thirteenth century entitled, "Continens'.

The work for which ar-Razi is best known is his treatise on smallpox and measles ('Kitab al-Jadari wa'l Hasbah'). This was translated into Latin many times over. It contains the first definitive descriptions of smallpox and measles. On this work, Neuberger is attributed by E. G. Browne with the following comment: "On every hand and with justice it is regarded as an ornament to the medical literature of the Arabs. It ranks high in importance in the history of epidemiology as the earliest monograph upon smallpox, and shows us Rhazes as a conscientious practititioner, almost free from dogmatic prejudices, following in the footsteps of Hippocrates." The Latin version of this work was called 'de Peste' or 'de Pestilentia'.

Another general work was dedicated to Mansur ibn Ishaq, governor of Ray from 903 A.D.. This 'Kitab al-Mansuri' is a summary of Greek medicine which was translated into Latin by Gerard of Cremona and printed in 1489. Leclerc notes that it was divided into 10 books which dealt comprehensively with anatomy, temperament, foods and medicines, hygiene, surgery, poisons, fevers, diets for travellers, and cosmetic care. Called 'Liber al-Mansorem' in Latin, it was highly esteemed in the medical schools of Europe, and incorporated into their teaching syllabuses.

Other medical works by ar-Razi include 'Diseases in Children' (he has been called the father of paediatrics), 'Of habit which becomes natural' (conditioned reflex theory), 'On stones in the

bladder and kidney' and monographs on gout, rheumatism and colic. On general medicine there exist (among a host of other writings) 'Jami' ('Compendium'),'Kafi' ('Sufficient'), 'Fakhir' ('Splendid') and the Lesser and Greater 'Madkhal' ('Introduction').

Being a universalist, his writings dealt as well with many other subjects. One book, divided into 12 chapters, considered questions pertaining to alchemy. In the time of ar-Razi this was not considered a pseudoscience. Nowadays one thinks of its less reasonable aspects (the transmuting of base metals into gold being one example), but then it also comprised what we now consider basic chemistry. It was this basic knowledge that ar-Razi applied to medical chemistry.

He produced numerous works of philosophy on subjects such as the incorporeal nature of the soul, matter, why beasts and reptiles were created, the metaphysics of Plato and Aristotle, spiritual medicine, dreams, angels, etc., etc. He wrote on religious matters as well, on faith, on the good road, on the necessity of prayer, on the prodigious and the prophetic, on what philosophers do not know, and so on.

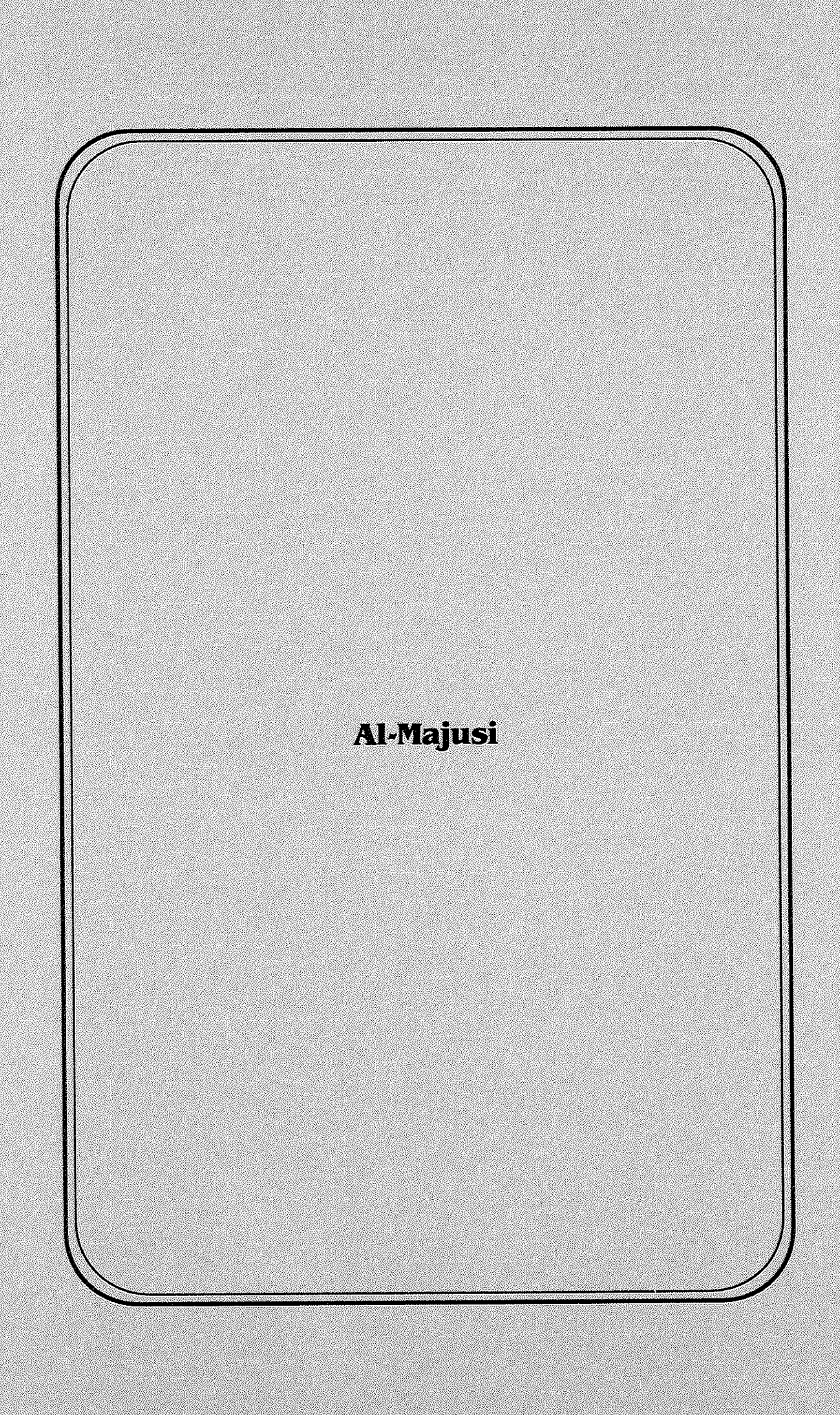
When we recall that in Europe even after his time, the concept of the sphericity of the earth was not universally accepted, his writings on this subject are of interest. He noted that the earth was a sphere, that it was placed in the midst of other spheres, that it had two poles about which it rotated and that it was smaller than the sun and larger than the moon.

He wrote on mathematics and on music (on this he produced a compendium).

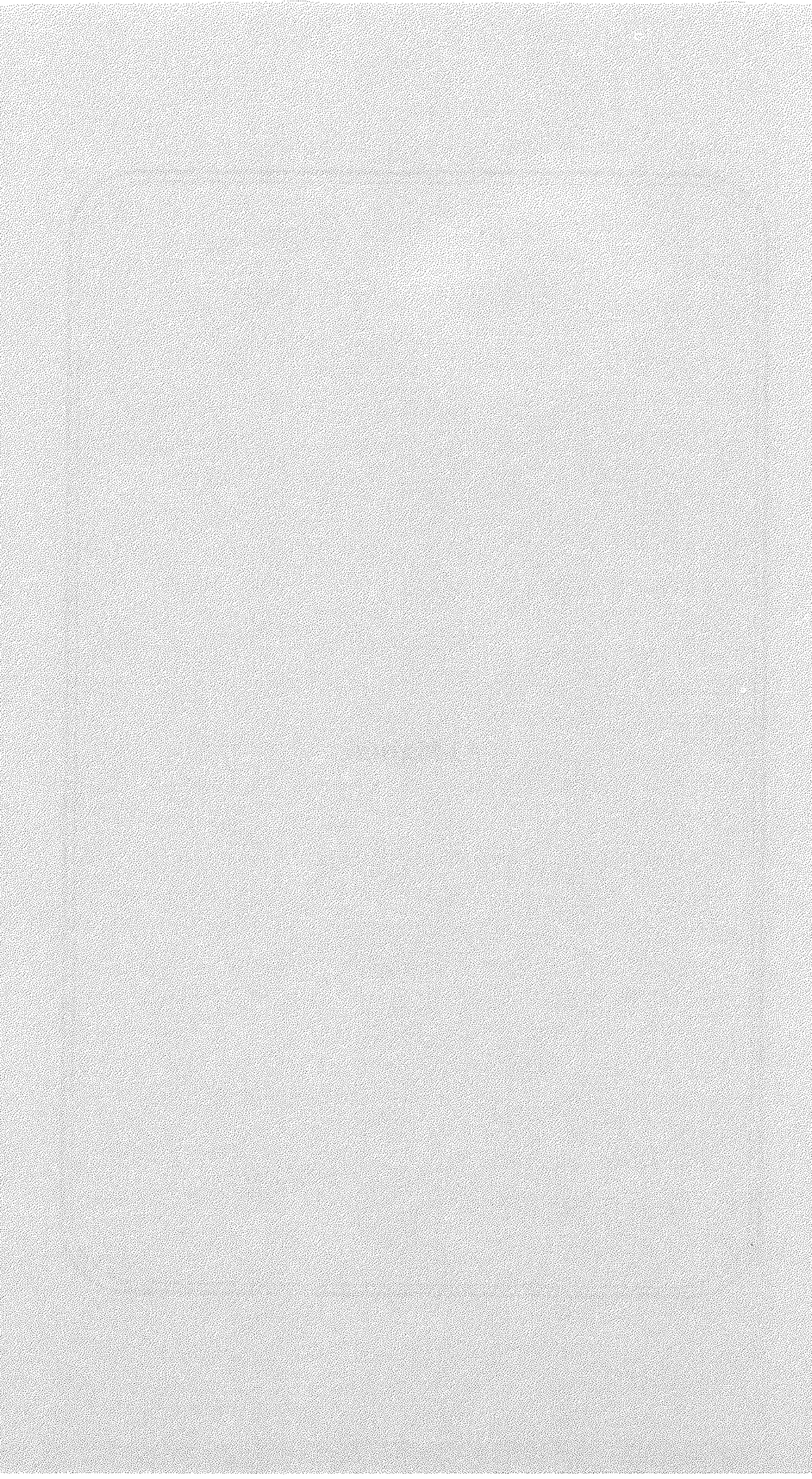
It is said that rather than great men producing great eras, it is a great era which produces great men. Ar-Razi is only one of the outstanding men of the Abbasid era, but he is incontestably the greatest of the great men of Medicine who arose in this period of history. As Leclerc writes, (translation) "he was the first great

physician produced by the Arabs, and one can even say he was unsurpassed and unequalled by those who came after him."

Just as Ibn Sina has been considered the 'prince of physicians' for the breadth of his theoretical work, ar-Razi, 'the experienced one' is justly accorded a similar position of fame as a practitioner of the art and science of medicine. In an admirable way, he combined the detached intellect of the scientist with a natural compassion (empathy) which together made him the outstanding physician he was.



Al-Majusi



Al-Majusi (Haly Abbas)

(? - 982/995)
(Ali ibn al-Abbas al-Majusi)

"Because the science of the medical arts is the most eminent of all the sciences, the most important in its power and its risks and the most useful, since all have need of it, and because I had not found a comprehensive book [on the science of medicine] among the works of either ancient or contemporary doctors containing every thing relevant to medical practice and science, I wished to encompass it in a comprehensive book on the medical arts which would contain everything necessary for doctors and all others for the preservation of health in those possessing it and for restoring health in those who are ill" (Al-Majusi, translation from citation of Julien Leclerc in "Histoire de la Medicine Arabe")

Ali ibn al-Abbas al-Majusi came from the town of Ahwaz which then lay near to Jundi-Shapur, the great centre of learning from which much of the fundamentals of Arabic knowledge derived. It is known that he studied under Abu Mahir Mousa bin Youssef ibn Sayyar of Shiraz, and that he went much further in his learning by acquainting himself with the writings of the ancients in personal untutored study. The name, al-Majusi is said to indicate that his father or grandfather must have been a Zoroastrian. Except for this, and the fact that he lived during the reign of the Buwayhid ruler, Adud ad-Dawla Fana Khusrau (and became his court physician) very little else is recorded. His date of birth is unknown. He is said by Manfred Ullmann to have died between 982 and 995 A.D. He reached his greatest eminence about fifty years after the death of ar-Razi.

As with many of the great physicans and scholars of Islam, it was the presence of a ruler who succoured and encouraged such

people that allowed him to develop fully. .His patron was Adud ad-Dawla Fana Khusrau, who reigned from 949 to 984 A.D. He is best known for the founding of the Adudi hospital in Baghdad, but he is also renowned for the one he built at Shiraz, and he also built numerous mosques, palaces and caravanserais. He is said to have been munificent when it was proper, but rather reluctant to disperse his wealth when it was more fitting to withhold it. The highest honours he reserved for men of learning, and he set aside a special room in his palace, close to his own private rooms and separate from the room used to receive other visitors and supplicants, for the use of such savants. He gave fresh impetus to the translation of the texts of the ancients, and recreated during his reign the atmosphere of the Abassids.

It was to Adud Ad-Dawla ("Arm of the State") that al-Majusi dedicated his one great work, "Kamil as-Sina'at at-Tibiyya" (The Perfect Medical Practitioner), which is also known, through the above dedication as "Al-Kitab al-Malaky" or "Liber Regius" This book contains 400 000 words in its Arabic version, and is divided into two sections, each of which have ten sub-sections. Manfred Ullmann describes it as "one of the great classical works of Islamic medicine.....able to maintain its fame alongside the Qanun of Avicenna right through the Middle Ages and into modern times". The language is described by Sleim Ammar as simple, clear and improved (when contrasted with ar-Razi's "al-Hawa" and Ibn Sina's "Qanun"). Fuat Sezgin notes that "Al-Kitab al-Malaky" and "Al-Mualaqat al-Bukratiya" (by Abu al-Hassan al Tabari) are the first true comprehensive handbooks of medical art. E. G. Browne considered al-Majusi's work to be superior to Ibn Sina's "Qanun" in style, arrangement and interest.

Julien Leclerc notes that the "Qanun" of Ibn Sina is the better work in theory but that in the practical aspects of medicine, "Al-Kitab al-Malaky" is just as well ordered, and that it is more

homogeneous and concise. He writes, [translation] "This book marks a giant step made by medicine in the East. An Arab dared to do what he had not found in the [books of] the Greeks, encompass the whole of medicine in a single work. In it, it is not a question, as it is in ar-Razi's "Al-Hawa", of making an inventory of all the facts bequeathed to practical medicine by the ancients and contemporaries. Knowledge in general is contained [in it] with each part coordinated. The facts claimed by each are submitted to the discipline of criticism and experience and thereby set within their respective frames of reference." Al-Majusi decided to write "Al-Kitab al-Malaky" after studying and assessing the works of others who had come before him. He had found Hippocrates to be too brief and thereby unclear and he considered Galen to be too long and full of repetitions. Oribasius and Paul of Aegina were incomplete. He thought the writings of Ahron to be adequate, but judged the Arabic translation to be a bad an obscure one. Yuhanna Ibn Serapion he criticised for neglecting surgery, for omitting some diseases and for having arranged his material unsystematically.The great ar-Razi's "Al-Hawa" was so large as to be inaccessible to most physicians (al-Majusi was aware of only two complete copies in existence even when he was working). Besides that, he felt the work was a vast compilation which lacked cohesion, and was, to boot, restricted to the practical aspects of medicine. He also felt ar-Razi's "Kitab al-Mansuri" to be overly brief

The first section of the book is divided into ten subsections dealing with the theoretical aspects of medicine:

1. *Theoretical basis of medicine*
2. *Anatomy of bones, muscle, glands, hair, etc.*
3. *Anatomy of distinct organs such as brain, eyes, nose, lungs, heart*
4. *Organ function; causes of death; natural powers and faculties*

5. *Exercise, dietetics, clothing, sleep, coitus, action of the bowels, influence of the 'spiritual constitution' on the body*
6. *Nosology, aetiology*
7. *Symptomatology, pathology, diagnostics*
8. *Disease with external signs and symptoms (fever, ulcers, wounds, fractures, bites*
9. *Internalised illnesses (e.g., melancholy)*
10. *Symptoms and crises*

The second section was likewise divided into ten subsections on practical medicine:

1. *Hygiene, physical exercises, dietetics ,therapy, cosmetics*
2. *Therapy with simple medicaments*
3. *Fever and tumours*
4. *Disease of the skin, burns, bites, poisoning*
5. *Therapy of disease of the head, eyes, ears, nose, mouth*
6. *Therapy of lung disease*
7. *Therapy of organs of digestion*
8. *Therapy of genitals and joints*
9. *Surgery, phlebotomy, cautery, cataract removal*
10. *Complex medicaments*

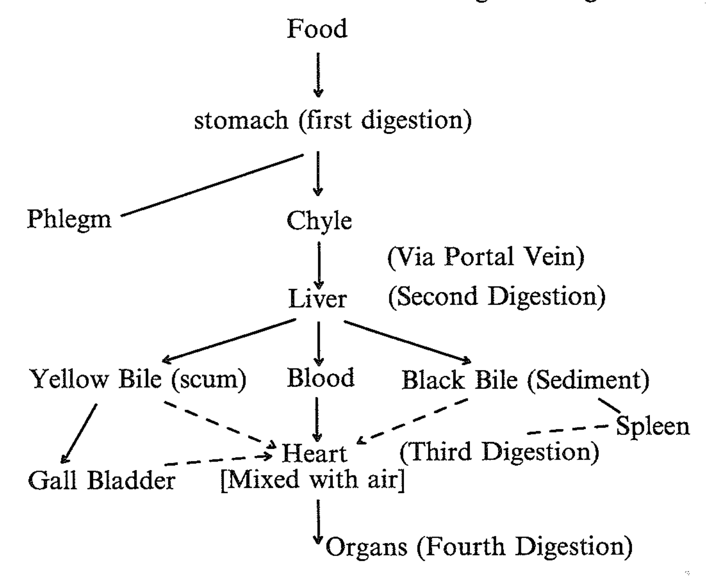
The book was taken up by the Islamic world as the standard text on medicine, and held this position until it was largely replaced by Ibn Sina's "Qanun".

This book was translated into Latin in about 1070 by Constantinius Africanus, who renamed it "Pantegni", and who neglected to state that he (Africanus) was not the original author. Africanus may have been under some pressure from his Christian patrons in Salerno not to attribute it, since he lived during the era of the crusades. Stephen of Antioch completed a translation in 1127, and this version was

published in Venice in 1492. It was also translated into Latin by Etienne the philosopher, with comments by Michel of Capella, and published in Lyon in 1523. An edition of "Kitab al-Malaky" was printed in two volumes in Cairo in 1877. A lithograph edition was also produced in Lahore in the nineteenth century.

Another smaller work attributed to al-Majusi, "Al-Kitab fi at-Tibb" of which there is a copy at Gottingen, is said to be, in fact, an excerpt from Ibn Rushd's "Al-Kulliyyat.

There are several places in Al-Majusi's book where his philosophy of medical practice and medical teaching are discussed. He was very much involved in both the above, of course. His approach to medical therapy was based on the theory of 'humours' which would seem to have been universally accepted in his time, and for several hundred years after. There were four humours, blood, phlegm, yellow bile and black bile which derived secondarily from the four elements, earth, air, fire and water. The way these humours arose from food is illustrated in the following flow diagram:



As the diagram shows, food first enters the stomach where the first stage of digestion occurs, the products being one of the humours, phlegm, and chyle. Chyle flows through the pylorus to the duodenum, and from there into the small intestine. There, the veins absorb it and pass it via the portal vein to the liver whose 'transforming faculty' brings about the second stage of digestion to produce yellow bile, black bile and blood, blood being the purest of the humours. Once these humours have been formed, they are then in a state of mixture, although some yellow bile is stored in the gall bladder and some black bile is kept in the spleen. Blood passes from there to the various organs of the body, including the heart, via the vena cava. It is the quality of the mixture which determines whether a man is healthy or not, and therapy is designed to return the quality of the mixture to that necessary to cope with the environment. Clothing and the appropriate amount of sleep were therapeutic factors. Emptying of the bowels was important. Bleeding and cupping were appropriate medical interventions. Al-Majusi nevertheless counselled moderation in all things.

A major factor in therapy was the use of drugs and nourishment to establish the proper balance. There were four categories:

1. *Remedies: the body first changes these;they then change the body.*
2. *Poisons: these cause changes to the body which the body cannot resist.*
3. *Remedial foods: these first change the body until the body gains power over them and transforms them into its own mixture*
4. *Pure foods: the body changes and transforms these into itself.*

Al-Majusi proposed a single meal each day. Beside food and remedies, the type of air was considered an important element in dietetics. Clean, pure air would render the humours also clean and

pure. Unclear, misty air would have the opposite effect. Pestilential air would engender epidemic illnesses and plagues

Transmissible illnesses might be brought about by a local or a temporal cause. Examples of local causes were unclean ditches, stagnant water, marshes, and dead bodies (human and animal). Temporal causes included 'unseasonal weather' such as unnatural heat, dryness, rains and cold. These factors might cause such transmissible illnesses to be contracted, but al-Majusi contended that a man's predisposition to the illness was the decisive factor. One could alter this predisposition by following a way of life which counterbalanced the external local and temporal causes. Therapy became necessary when a man had by neglecting himself already assembled bad and corrupt humours, and thereby contracted an illness.

Al-Majusi considered as transmissible illnesses diseases such as leprosy, elephantiasis, scab, consumption,, phrenitis, smallpox, trachoma and albugo. They could be caught by inhaling bad air. He had observed that such illnesses might be passed from one person to the next by both sitting together, and he attributed this to the breathing of an evil vapour given off by the affected individual.

He reasoned that Diabetes mellitus arose because of the excessive strength of the 'attractive faculty' by which the kidneys draw to themselves the watery constituents of the blood, and he attributed this to a hot dyscrasy of the kidneys, which also weakened their 'retentive faculty' and allowed the loss of water into the bladder.

The diagnosis of Diabetes was based on the following observations:

1. A burning thirst without fever

2. Nevertheless the body is not dehydrated

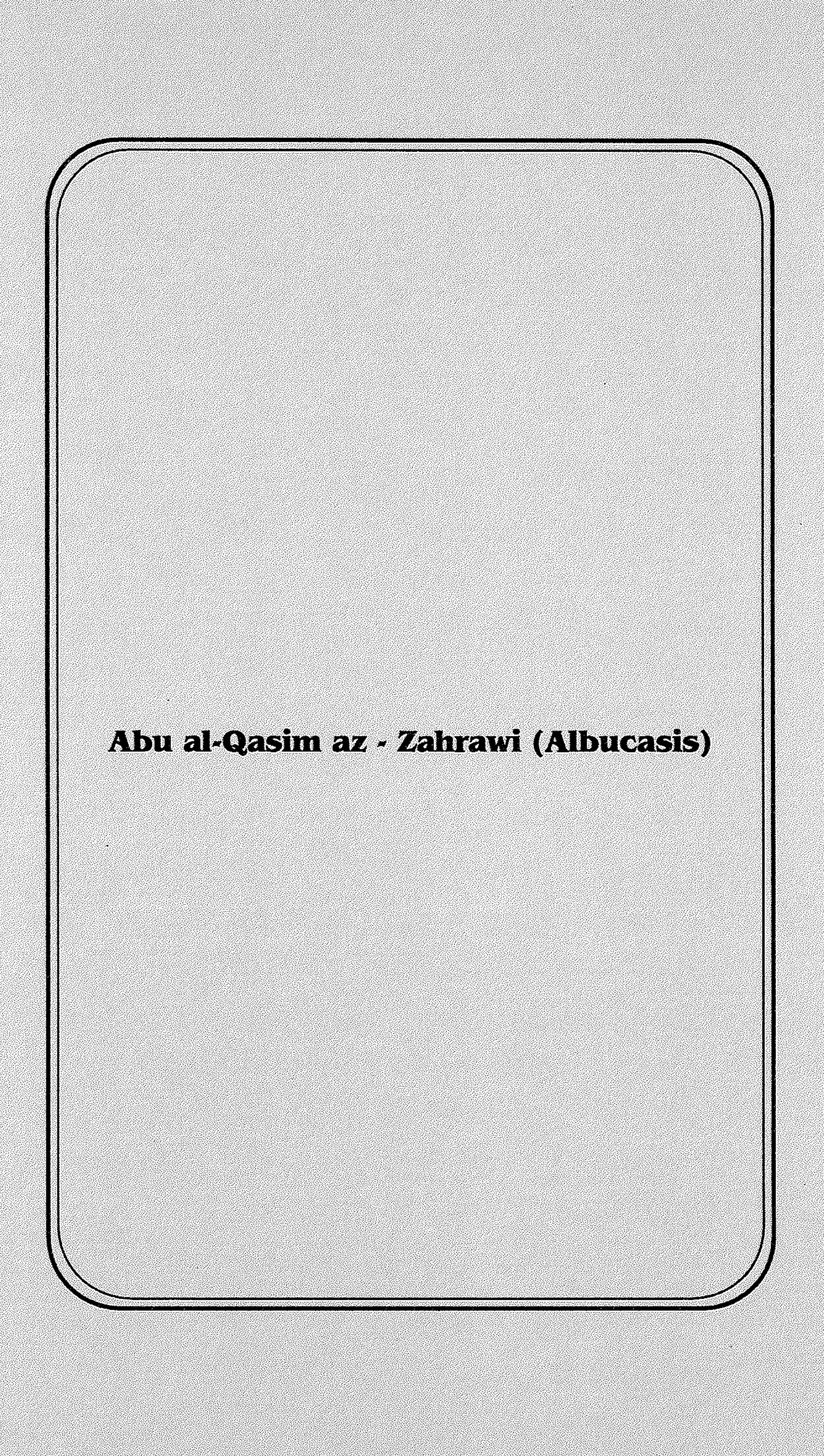
3. A copious urine is produced which is watery, because water has passed through the liver and kidney without being altered.

He was unaware of, or didn't mention, the raised sugar content of the urine, or its sweet taste.

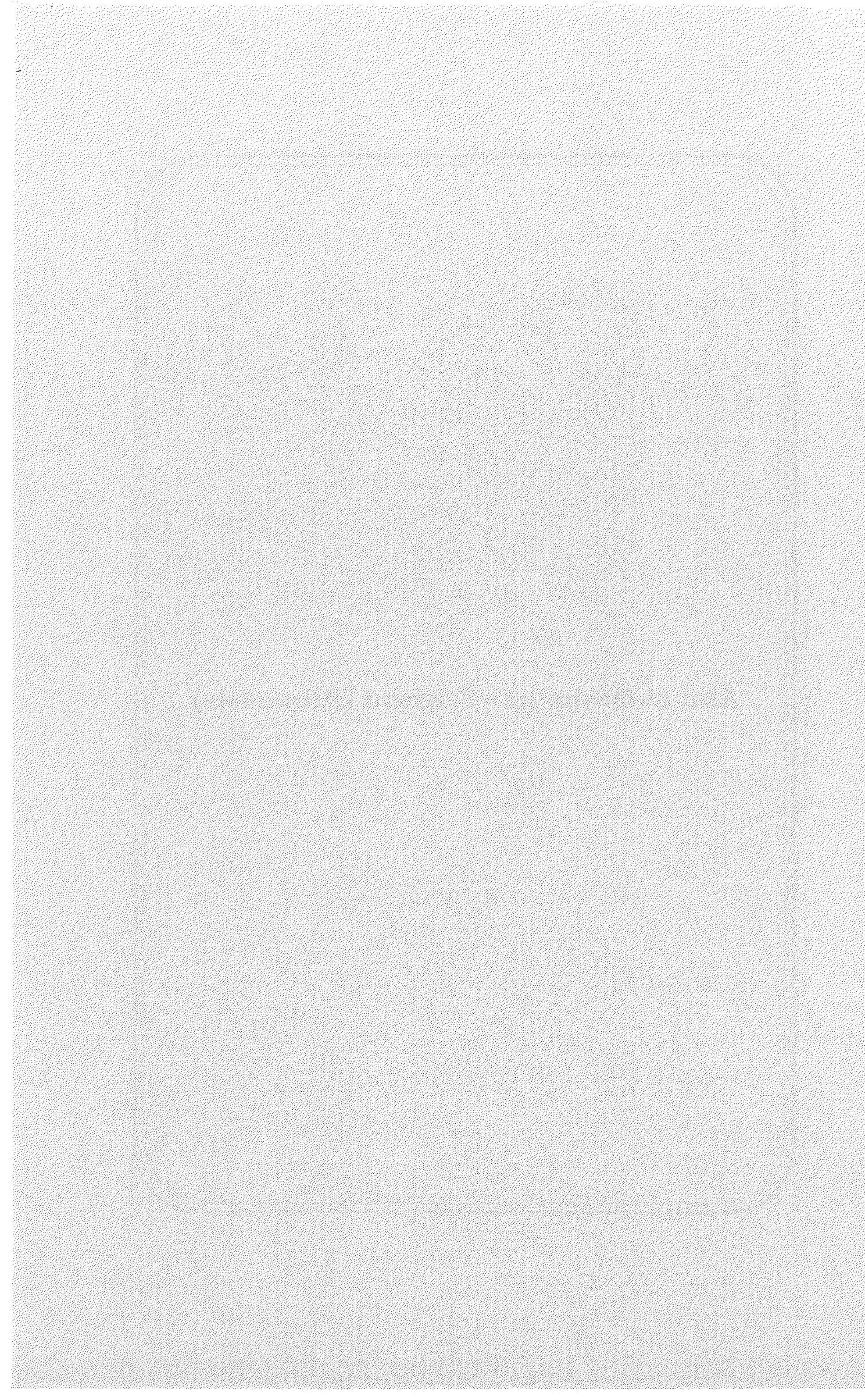
Some seventy years ago, E. G. Browne noted what he described as a remarkable passage in the "Kitab al-Malaky". Here, the author describes how, during diastole, the arteries near the heart draw air and "sublimated blood" from the heart. This occurs, he reasons, by virtue of a vacuum which is formed in the heart at diastole, since the heart has been emptied of blood during systole.He also believed that arteries near the skin drew air from the atmosphere itself. The really important comment in this section concerns the intermediate arteries (those midway between the heart and the skin). He states that they have the property of drawing from the veins the "finest and most subtle of the blood". He explains, "This is because in the non-pulsating vessels (i.e., the veins) are pores communicating with the pulsating vessels (i.e., the arteries. The proof of this is that when an artery is cut, all the blood which is in the veins is also evacuated". The above, which is a quotation of E. G. Browne's translation. Browne notes, **"Here, it seems to me, we clearly have a rudimentary conception of the capillary system."**

Besides being an author and a practising physician, al-Majusi was a teacher of medicine. This followed from his position as a physician in a hospital, since the proper functioning of a hospital depended upon the teaching of the junior practitioners and apprentices by those of experience. E.G. Browne quotes Al-Majusi's thoughts on the importance of regular attendance at the hospitals: "And of those things which are incumbent on the student of this Art are that he should constantly attend the hospitals and sick houses; pay unremitting attention to the conditions and circumstances of their inmates, in company with the most acute professors of medicine; and enquire frequently as to the state of the patients and the symptoms apparent in them, bearing in mind what he has read about these variations, and what they indicate of good or evil. If he does this, he will reach a high degree in this Art. Therefore it behoves him who desires to be an accomplished physician to follow closely these injuctions, to form his character in accordance with what we have mentioned therein, and not to neglect them. If he does this, his treatment of the sick will be successful; people will have confidence in him and be favourably disposed towards him, and he will win their affection and respect and a good reputation; nor withall will he lack profit and advantage from them. And God most high knoweth best."

There is, as has been noted, very little factual information on Ali ibn al-Abbas al-Majusi. However his one great work, "Kitab al-Malaky", or "Kamil as-Sina'at at-Tibbiyya" shows him to be an effective and talented writer and a very knowledgable physician. His close association with the eclectic ruler, Adud ad-Dawla, whose court physician he became, proves his undoubted eminence in his own time, and the solid opinion of serious students of Arabic Medicine in modern times ranks him amongst the foremost of the eminent figures of medicine from the most productive period of Arabic Medicine.



Abu al-Qasim az - Zahrawi (Albucasis)





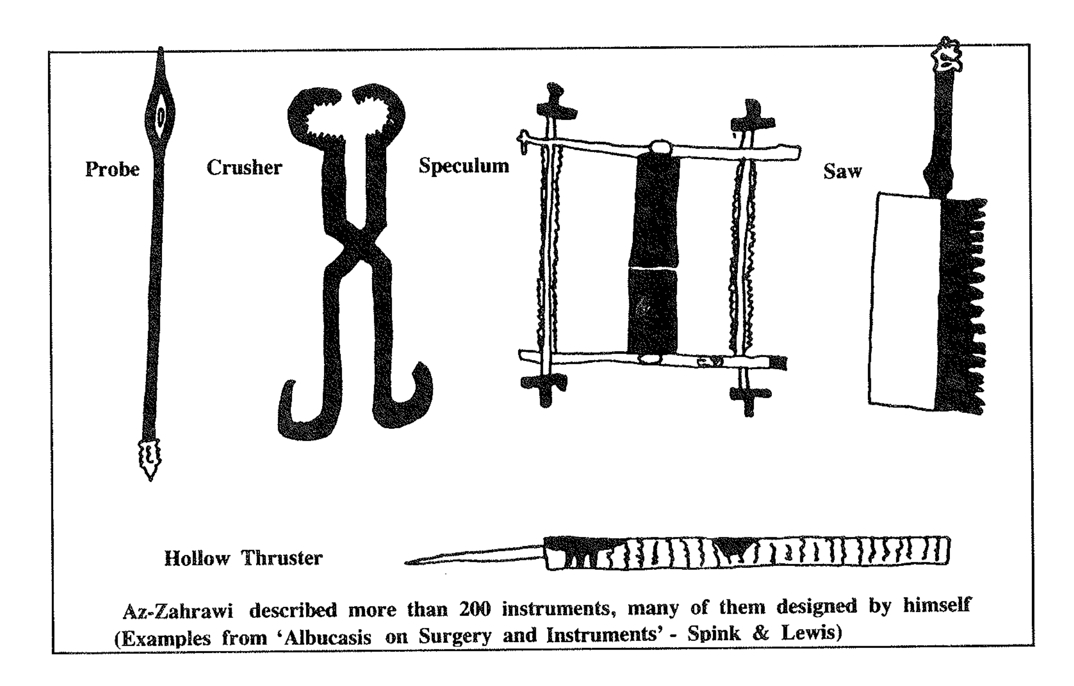
الجراحة عند المسلمين

والذين عرفوا عملية القيصرية ابتداء من القرن الثاني الهجري حيث برع فيها الجراحون المسلمون وطوروها. وقد أفتى علماء المسلمين فتوى خاصة بجواز فتح بطن الأم إذا كان في ذلك إنقاذ للجنين.

Surgery among the Muslims

Caesarian Section was carried out from the time of the prophet Mohammed. The Muslim Doctors excelled in this operation and made improvements on it.

Bone-setting-treatment for a dislocated shoulder. From an Islamic manuscript, describing skeletal treatments for fractures and dislocations



Az-Zahrawi described more than 200 instruments, many of them designed by himself (Examples from 'Albucasis on Surgery and Instruments' - Spink & Lewis)



Abu al - Qasim az - Zahrawi (Albucasis)

[936 - 1013 A.D.]
"The greatest surgeon of Islam"
(Abu al-Qasim Khalaf ibn 'Abbas az-Zahrawi)

"The reason for there being in our time no expert surgeon to be found is that the art of medicine is an extensive one. He who wishes to practise it should familiarise himself with anatomy, as Galen has described it, must concern himself with the functions, forms and composition of the organs and their reciprocal interdependence and must finally acquire an exact knowledge of bones, nerves, muscles, the moving and quiet blood vessels and the places from which they originate. As Hippocrates said, the name [physician] is possessed by many, but the practice belongs to few." (from Manfred Ullmann's German translation of the words of az-Zahrawi)

Just how extensive the early empire of Islam was is not appreciated by most Westerners. It stretched from east of Iran (in what is now Uzbekistan and Turkmenistan) westward to the Atlantic ocean where, for many centuries, its western limits embraced not only Morocco but also most of what is now modern Portugal and Spain and probably, a small part of southern France. This was al-Andalus, the Western Caliphate. The Iberian peninsula had been occupied early in the history of Islam, with the original victories due to Tarik bin Ziyad, the brilliant lieutenant of the governor of Ifrikiyya, Musa bin Nusayr. A permament memorial to Tarik is found in the name 'Gibraltar', which derives from 'Jebel at-Tarik' (mountain of Tarik). These victories culminated in the defeat in 711 A.D. of the Visigoth king, Roderic, and the capture of Cordoba, Toledo, Seville and Merida shortly thereafter. In the time of az-Zahrawi, al-Andalus was a vigorous and prosperous land of

some 10 million inhabitants who were a mixture of arabicised Neomuslims (Spaniards who had become Muslims), Muslim Berbers from the parts of the Maghreb nearest to al-Andalus, Blacks, Slavs, Christians, Jews and - as the ruling minority - Arab immigrants. In the tenth and early eleventh centuries under the successive rules of Abd ar-Rahman III, al-Hamak II and Ibn Abi Amir (in the nominal reign of Hisham II), the Western Caliphate enjoyed its golden age. In 936, Abd ar-Rahman III began the construction of the city of az-Zahra 5 miles outside Cordoba, using the best stone and marble and importing craftsmen from the Eastern Caliphate to design a suitable symbol of the power and grandeur of the Andalusian state. It was here, in one of the noble houses, that az-Zahrawi was born in about the year 936 A.D.

Az-Zahrawi was also called al-Ansari; this indicates that he belonged to one of the families that had emigrated from Arabia. The name, az-Zahrawi, indicates of course that he himself was a native of az-Zahra. Europeans knew him as Albucasis, Bucasis, Alzahravius, Alsarabius and many other strange corruptions of the original Arabic. He attended the University of Cordoba which was even then 150 years old. Cordoba itself had a population of about one million inhabitants at this time. Although it is disputed, he is said to have been court physician to Abd ar-Rahman III and Hakam II. He was a general physician, a surgeon par excellence, an educator and a psychiatrist.

According to Ibn Abi Usaybi'a, the 13th century medical biographer, az-Zahrawi was an excellent doctor, well versed in medications and skilled in therapy (F. Sezgin), but he doesn't describe him as a great surgeon, and this he most certainly was. Possibly this is because surgery was not held in great esteem at this time. In his own time, az-Zahrawi complained that it had fallen into a position of contempt in his land and that it would soon be extinguished. The works of the ancient authors had been corrupted

by the mistakes of the many copiers of them. Az-Zahrawi resolved to revive surgery from its moribund state. His writings attest to the fact that he did so.

Spink and Lewis note that az-Zahrawi is said by Leo Africanus to have lived 101 years, dying in the year 1013. If the date of his birth is more or less correct at 936 A.D., then he actually lived for about 77 years, still a considerable age even in our times. The last few years of life must have been difficult. In this period, the cohesion of the Andalusian state was destroyed with the various factions within it fighting for control, and he is said to have died during or shortly after the destruction of az-Zahra by the Berbers.

His activities were certainly not restricted to surgery alone. He is credited with being the first to describe haemophilia. A good deal of his writing is involved with the collection, preparation and administration of medicines. The art of bringing up children was another of his interests, together with what we would now consider Obstetrics and Gynaecology. He also busied himself in the quite distinct field of Dentistry. Az-Zahrawi noted that if metals other than gold were used in wiring teeth, they tended to tarnish and to affect the mouth adversely. As previously mentioned, he worked in the area of psychiatry. He was keenly aware of the effect of the personal relationship between the doctor and his patient on the healing process, and he strongly advocated that the doctor show a continuing interest in each of his patients to the extent of paying frequent visits both to monitor the course of the illness and to bolster the patient's morale. He was aware that time was an important factor in healing or recovery. As one can see from his writing, he was a dedicated educator who took pains to provide his students with a wealth of detail and the wisdom he had gained in the practice of medicine.

However, despite the very wide spectrum of his own interests in the field of medicine, he was a strong supporter of specialisation.

The Dictionary of Scientific Biography quotes him as follows: "Too much branching and specialising in many fields before perfecting one of them causes frustration and mental fatigue." Unlike Ibn Sina, he seemed to feel that medicine was in itself sufficiently demanding without the student being required to wander off into alchemy and philosophy. To him, speciatisation meant restricting one's self to Medicine.

Before considering az-Zahrawi's accomplishements in surgery, it might be helpful to digress briefly at this point to mention the ways in which the Arab surgeon dealt with the problem of pain. Surgeons knew the pharmacology of opium and other central nervous system depressants (Ezzat Abouleish). Ibn Sina wrote a description of the technique of rendering a patient unconscious without harming him by the use of "sweet-smelling moss, lignum aloes" or, in very painful procedures, water from darnel grasses or "Fumitory, opium, hyoscyamus... nutmeg, crude aloes wood...or boil black hyoscyamus in water with mandagore bark until it becomes red" Taha Jasser quotes the following passage from Ibn Sina: "A patient who wants to have an amputation of one of his organs must have a drink prepared from a mixture of Mandagora and other sleeping drugs." Other plants used were cannibis, opium, hemlock, bhang and hyoscyamus.

The 'soporific sponge' was an Arabic development. Such a sponge was soaked in aromatics and narcotics, after which the patient was bid suck on it. Just before the operation, the sponge was held under the nostrils. The drugs used were cannibis, opium, hyoscyamus and a plant called Zoan.

It is in the realm of surgery that az-Zahrawi is judged to have excelled. His skills benefited not only his own patients but those of his students and other readers who were enthused by him. In his writings, he described the ligaturing of arteries, and recommended several types of thread and catgut. He was aware of the dangerous

folly of attempting to excise an aneurysm without first isolating it. He performed bladder lithotomies both by incision and extraction and by using pressure to disintegrate the stone. He dealt extensively with fractures, including those of the skull where he used trephining to remove the bone in a depressed fracture. He successfully treated wounds to the abdomen - on occasion even when portions of the alimentary tract were protruding. Az-Zahrawi found that small wounds to the intestine itself might heal if sutured. One of the methods of suturing such wounds which he described was most ingenious! The edges of the wound were brought together, and the open jaws of an ant were applied in such a way that they gripped and held the wound together. When the ant's body was removed, the jaws remained behind, holding the wound together. Of course, a single ant was not sufficient. The number required for suturing in this way was proportional to the length of the wound.

Az-Zahrawi was cautious in his approach to the treatment of cancers, restricting surgery to those which were small or in positions where total eradication was possible. "When it is of long standing and large, you should leave it alone. For I myself have never been able to cure any such nor have I seen anyone else before me".

He instructed midwives on dealing with labour, both the normal and the complicated, and he elaborated instruments for use in the procedure of extracting a dead foetus. His description of the technique is given in detail.

He performed tonsillectomies, and wrote a description of his technique containing a premonitory paragraph informing the reader about those buboes found in the throat which should not be touched with an instrument. His procedure included grasping the tonsil with a hook and then severing the peduncle with an instrument he had designed for the purpose (taking care not to remove any of the mucosa).

Az-Zahrawi considered cautery a surgical technique, as indeed it can be. It was considered a suitable treatment in his day for myriad disorders, among which were cancer, gangrene, haemorrhoids, hernia, toothache and chronic apoplexy. Cautery was even applied to the curing of melancholy, migraine and forgetfulness. Certainly, the patient would be unlikely to forget the treatment at any rate.

In all his writings on surgical and other techniques, he wrote in great detail and with a full practical and theoretical knowledge of the subject. His great work is the 'Kitab at-Tasrif li-man 'ajiza 'an at-Ta'alif', which is translated by Spink and Lewis, who produced an English translation of the sections on surgery, as 'The book enabling him to manage who cannot cope with the compilations'. Much of what is written derives from earlier writers (mostly from Paul of Aegina), but it is also solidly based on his own knowledge and wisdom gained from about 50 years of personal experience. The book was finished around the year 1000 A.D. It covers the whole of medicine in thirty sections. The first is concerned with physiology. Other sections deal with simple medicines (arranged alphabetically), their preparation and the various synonyms used in naming them. A section deals with cosmetics and one deals with oil extracts from plants. It is section 30 which deals with surgery. Spink and Lewis have produced a complete translation of this part, with English and Arabic texts juxtaposed. An imposing feature is the description of more than 200 instruments used in the various procedures included in the section on Surgery, most of which are said to have been of his own design.

A fine display of replicas of some of the instruments of az-Zahrawi were on view in the library of the Islamic Centre for Medical Sciences in Kuwait before the hostilities of 1990 - 91.

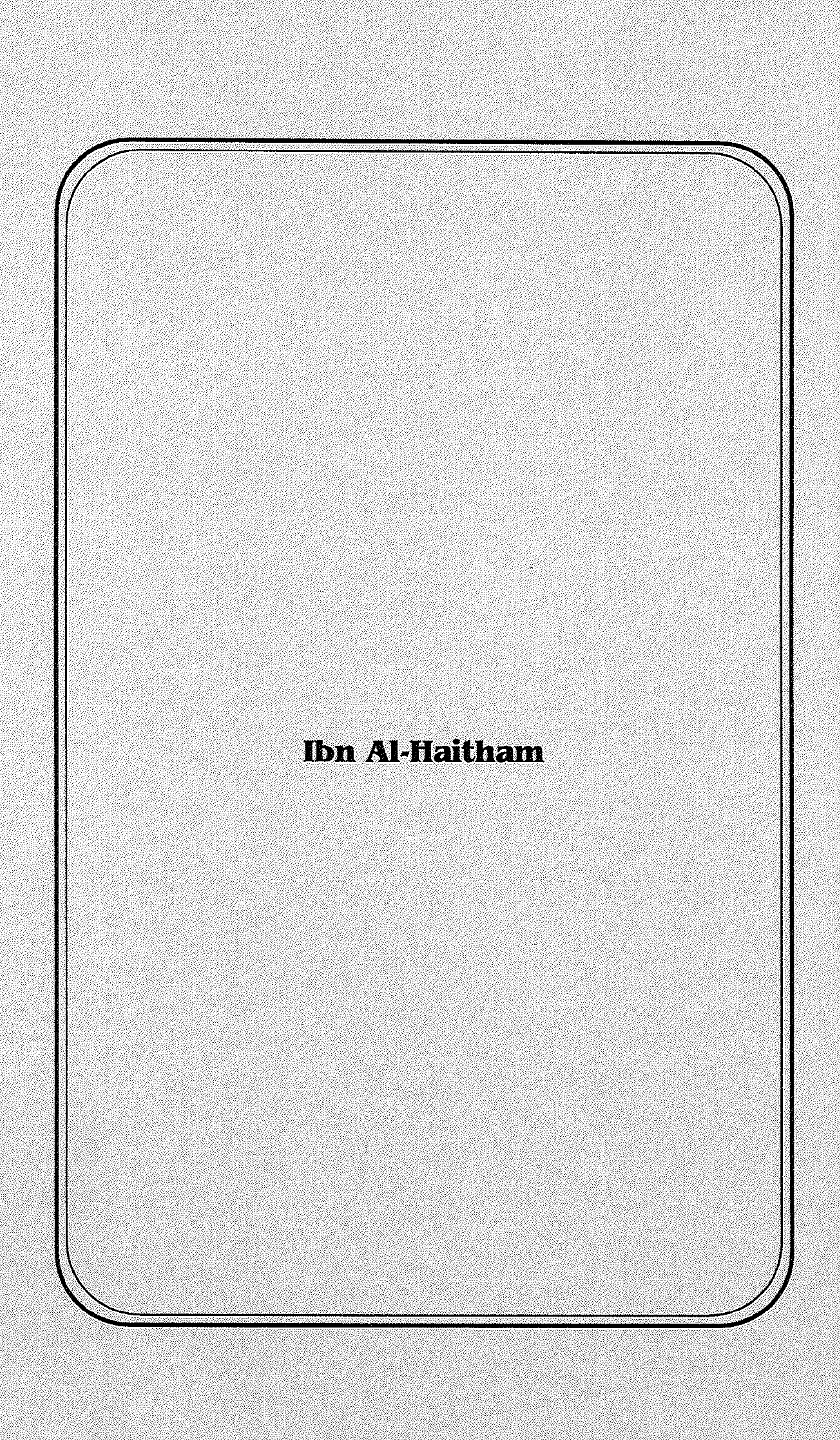
Although az-Zahrawi was largely ignored by the Eastern Caliphate, his influence on Europe was immense, most particularly in Surgery.

He was translated into Latin by Gerard of Cremona, who came to Toledo in search of Ptolemy's 'Almagest' and thereafter became dedicated to the translation of Arabic texts. Gerard was born about 100 years after the death of az-Zahrawi. Other eminent translators who also produced translations of his works were Rogerius Frugardi, Rolandus Parmenus and Arnold of Villanova. In 1395 in the medical school of Paris, of the 8 books used for teaching, 5 were Arabic. Az-Zahrawi's 'Theriaca and Antidotarium' held pride of place amongst these. Because an illustrious surgeon, Guy of Chauliac, highly esteemed az-Zahrawi, he based his own book, 'Inventarium et collectorium artis chirurgicalis medicinae' upon the Arab surgeon's writings with the result that his influence stretched up to the 18th century.

In conclusion, Abu al-Qasim az-Zahrawi was an exceptional man of superlative intellectual and practical abilities who revived the art and science of surgery in his own time. In his writings, he was able to draw on a reservoir of medical knowledge spread throughout the whole of the great Muslim Empire stretching from beyond Persia to Spain. The previous work of diligent translators such as those working under Hunayn ibn Ishaq had prepared a way into the knowledge of the ancients in the form of Arabic translations of their works (including that of Paul of Aegina). Cordoba, in which az-Zahrawi worked, contained a hospital and a medical school which were themselves on a par with anything to be found in Baghdad, Damascus and Cairo. The translation of his works into Latin and other European languages made him the most important source of surgical information available to a renaissant Europe.

Acknowledgement

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Ibn Al-Haitham



Ibn Al-Haitham
(Alhazen, Avennathan, Avenetan)

the second Ptolemy
(Abu Ali Mohammed bin al-Hassan bin al Haitham [al-Basri al-Masri])

"In these days, where the pursuit of science is as often related to death and destruction in war as to improving the lot of mankind, it is of particular significance that the work of Ibn al-Haitham was directed only to the development of human understanding of nature. His profound researches in optics and the structure and function of the eye were made when Europe was suffering the deep malaise of the dark ages of learning which succeeded Greece and Rome. His elegant use of geometry and mathematics in physics preceded by seven hundred years the discoveries of Newton. Arabian contributions to natural knowledge were great, but those of Ibn al-Haitham must be acknowledged as some of the greatest scientific achievements of all times." [Professor Sir M. L. Oliphant; letter in the Hamdard National Foundation's Proceedings of the celebrations of the 1000th anniversary of the birth of Ibn al-Haitham]

Abu Ali Mohammed bin al-Hassan bin al Haitham al-Basri al-Masri (some have substituted Hassan for Mohammed and al-Hussein for al-Hassan) was born in about the year 965 A.D. in the city of Basra, which is now in the state of Iraq, and which was then controlled by the Abbasids. In later centuries, he was to be known in Europe by the names Alhazen, Avennathan, or Avenatan, according to Vernet. Ahmad Khan has written, "Unlike the boys of his own age, ibn al-Haitham took scholarship seriously, till he immersed himself wholeheartedly into a quest for knowledge, and his appearance became almost that of an insane person".

He did well in his early studies and he obtained a government position in Basra. According to Ibn Abi Usaybi'a, [translation] "His inner resources made him very intelligent with respect to the art of science. During his time, no one could match or even come close to him in the science of mathematics. He was always at work, doing many things; he was exceedingly liberal and fond of that which was good." Hameed Askari writes, "having been endowed with an exceptional intelligence and a quick grasp, he was able to scale the rungs on the ladder to promotion, reaching a prestigious post". Certainly such positions would have required ability, but at this period, they also required access to persons of influence. As Nazir Ahmed notes, the fact that he did obtain such a position means that he probably came from an average middle class family with the 'connections' such a family would have to have established in order to be accepted into such service. Lucien Leclerc suggests that he may have become governor of his native city. He was to become much more than that, however. He was a polymath, turning his intellect to a whole range of scientific disciplines including religion, philosophy, mathematics, physics, medicine (in which his interest was almost entirely theoretical), engineering and the arts (poetry and music). His greatest achievements were in the field of optics [he is called, "the father of optics"]; it is in this field that ibn al-Haitham performed the greatest service for medicine.

He was, and remained, a devout Muslim for his entire life. One reads very little about his character that would suggest he was anything but what his actions depict him as - a man of genius set aside from the rest, godly and full of compassion for his fellow man and, it would seem, truly, single-mindedly devoted to the search for knowledge. It is said that he feigned madness on two occasions, once to escape from the chains of his duties in Basra, and once to escape the wrath of a disappointed caliph. I would hazard the suggestion that he was a gentle man who dealt with his crises in a

way that would harm no one else. Hakim Mohammed Said and Ansar Zahid Khan have stated, "Ibn al-Haitham's object was justice and not passion, and as paradigms he takes Galen and Aristotle."

Very little is known about his actual movements. Leclerc quotes him as noting that "affairs and travelling" had interrupted his work. It is certain, however, that he moved to Egypt sometime after the year 996 A.D. (the date of the accession to power of al-Hakim in Fatamid Egypt), and some have written that he spent some time in Syria following his fall from favour with al-Hakim. In 996, he would have been about 31, but al-Hakim would have been only 11. One might then suspect that his move to Egypt actually took place somewhat later when he was in his forties (and al-Hakim in his twenties). Little is likewise known about what he did up to this time, but he was known to have written in one work ("Hilat-ul-al-Bar") that he felt certain that if he were in Egypt, his knowledge would enable him to control the Nile river so as to prevent the depredations of the yearly inundations and to allow a proper irrigation of the land about it. This reached the notice of al-Hakim (perhaps al-Haitham wrote him personally), who was sufficiently aware of Ibn al-Haitham's reputation that he took him seriously. Indeed, he sent an intermediate to Basra with an invitation to visit Egypt and a sum of money to allow him to undertake the trip. Ibn al-Haitham's decision to do this entailed his moving from one Islamic state (the Abbasid Empire) to another (the Fatamid Empire). In effect, he left the protection of the Abbasids and placed himself in the service and under the rule of al-Hakim.

Indeed, it is quite certain that Ibn al-Haitham would have heard of al-Hakim [996-1021 A.D.] if any time at all had passed after al-Hakim's accession to power before his invitation reached him, and what he might have heard would have made him think more than twice before making what was a change of loyalties as well as of

homes. Al-Hakim bi-Amr Allah [Abu Ali al-Mansour] was born in 985 A.D., the son of al-Aziz (the previous caliph) and a Christian mother. He was named 'wali al-ahad' [crown prince] in 993 A.D. at 8 years of age, and became caliph when he was 11. He was a very enigmatic figure. He was, as Canard (Encyclopaedia of Islam) writes, "one of the most famous caliphs because of his excesses, his cruelty, his persecutions, particularly of the Christians, the divine character which certain of his supporters attributed to him"....."al-Hakim resorted to executions for all kinds of reasons, among them to inspire terror and as a method of government". At the age of fifteen, al-Hakim arranged the murder of the Slav Burjuwan, whose strictures on his freedom of movement he found irksome. His strange order to burn al-Fustat led to unbelievable suffering and much loss of life. Another order which led to the destruction of the Church of the Holy Sepulchre in 1010 A.D. is said to have been one of the causes of the Crusades. It certainly destroyed his relationship with Byzantium. He persecuted the Christians and the Jews with some vigour and ferocity (although three of his eight viziers were in fact Christians) only to soften towards them later on. All this has earned him the epithet, "Caligula of the East". In fact his attitude towards the Christians and Jews is not typical of the Fatimid dynasty generally. Canard has written, "tolerance to Christians and Jews is one of the characteristics of the dynasty".

Yet other actions taken by him seem ridiculous when viewed from this distance in time. He prohibited the playing of chess. He ordered the extermination of all dogs because their barking annoyed him. At one point he confiscated the personal possessions of his mother, sister and wife. He would order executions for little or no reason at all.

And yet, paradoxically, his rule had its positive aspects. He built what is termed the first Muslim university, the "Dar-al-Hikma" (of course, the al-Azhar mosque complex predates this).

This was originally located in the northwestern part of the Western Palace. It contained a library, a reading room and places for meetings for traditionalists, jurists, grammarians, doctors, astronomers, logicians and mathematicians (D. Sourdel, Encyclopaedia of Islam). He was at times extremely generous, and he did his very best to combat famine among his people. His interest in ibn al-Haitham must have been aroused by the possibility he saw of improving the lives of his subjects if the Nile could be controlled. He even went so far as to abolish an onerous tax, the "Fifth" (which apparently required everyone to submit a fifth of their income to the ruler). In his later years, he became an ascetic, dressing himself in rags and wandering the streets in a seemingly aimless manner. Al-Hakim died in 1021 A. D. in strange circumstances apparently during one of his solitary trips about Cairo. Possibly he was assassinated.

However, ibn al-Haitham did come to Egypt, and he was accorded the honour of having al-Hakim come out from Cairo to meet him at the village of Khandaq which stood outside one of the gates to the city. The caliph greeted him with much honour, and bade him rest for some time before taking on his duties. Eventually, he did proceed up the river Nile, accompanied by a host of engineers, until he reached the cataracts at Aswan. There he studied the lay of the land and of the river for some time. Finally, with much chagrin, he had to admit that the vision he had had of controlling this great river was beyond his capacity to realise [about a millenium later, the Aswan high dam was constructed on or near the site he had chosen]. It would seem that he also realised that much of what he had in mind for controlling irrigation of the land about the nile had already been done by competent Egyptians who had preceded him. Notwithstanding his knowledge of the caliph's ferocious nature (he had seen several unfortunates executed by him), he could not bring himself to withhold this news from him.

Al-Hakim appeared to accept ibn al-Haitham's defeat with equanimity, but the latter became convinced that he was in mortal peril. He feigned madness in an attempt to deflect from himself the caliph's anger. Apparently, he was incarcerated in a quiet house (put under 'house arrest' as one might say nowadays), and all his books and instruments were confiscated and placed in the royal stores. It is at some time during this period that he is said to have possibly accompanied the Amir of Simnan to Syria (Kamal Mohammed Habib). Whatever the case may be, when al-Hakim died in 1021, ibn al-Haitham was at liberty once again to throw off his feigned madness. He did so and moved to a room in the al-Azhar mosque complex, where he earned a living by copying ancient texts. He lived a very productive life for a further 18 years, first under the caliph az-Zahir [1021-1036] and then for about three more years under al-Mustansir [1036-1094]. He died in about the year 1039 A.D. When his end was near, he is said to have spoken the following words: "Geometry has become futile, medicine a foolhardy affair. All that is now left for me is to entrust my soul to its creator" He then turned towards Makka and said, "Oh Lord, I turn to Thee, Lord of lords, it is in Thee alone that I repose all trust and Thee I address" [Nowsheri].

It might be helpful to digress at this point to give a brief description of the history of al-Azhar (mostly from J. Jomier, Encyclopaedia of Islam). The construction of al-Azhar ("the most brilliant") was begun on April 4th, 970 by the victorious Fatimid general Djawar al-Katib al-Sikilli. It was designed not simply as a mosque, but also as the residence of the caliph Abu Tamim Ma'add al-Mu'izz together with his entourage. It was inaugurated slightly more than two years later on June 22, 972.

The Fatamid caliphs such as al-Mu'izz, al-Aziz, al-Hakim, al-Mustansir, al-Hafez and al-Amir further enlarged it and endowed it, making it a university of renown. By taking a 'room' at al-Azhar.

ibn al-Haitham was joining the company of many of the savants of his age. M. S. Manus has written, "Al-Azhar is the oldest university in the world. In those days, about 1000 years ago, al-Azhar was the greatest and most learned spot on the globe. Its atmosphere was charged with the love of learning, desire for research and devotion to literary pursuits. The rulers and the public were all patrons of learning. There was no better place on the face of the earth to gather necessary inspiration and to do creative work".

Jomier notes that al-Baghdadi taught medicine there towards the end of the 12th century. The Mamelukes, who seized control of Egypt in 1254, did much to restore it from a state of dilapidation. Unfortunately, it sustained considerable damage during the earthquake of 1302 A. D. Under Ottoman domination, it was a bastion in Cairo from which the study of the Arabic language and religious learning continued to be carried on while all the other colleges disappeared. Commenting on its status in the 18th century, Jomier states that, "it can be considered from that time as the principal religious university of the Islamic world". He further notes that in 1953, there were 30,000 pupils and students enrolled there, of which 4,500 were foreigners. When these foreign students return home, they propagate throughout the world a knowledge of the religion of Islam and the Arabic language. In addition, teachers from al-Azhar are seconded from the university to take their knowledge and skills abroad.

From his room in al-Azhar, ibn al-Haitham made copies of Euclid, Ptolemy's Almajest and the Mutatwassitat every year, and he sold these to eager buyers who accepted his price of 150 Egyptian dinars without haggling or hesitation (Usaybi'a). This he did to earn a living. What he did to advance human knowledge and thereby earn lasting fame is the subject of the rest of this essay.

The Shorter Oxford English Dictionary gives as one of the definitions of the word, 'induction', the following: "the process of

inferring a general law or principal from the observation of particular instances". Pragmatically speaking, it entails the observation of the particular [i.e., the results from experiments] until it is possible to make the intellectual jump to the general [i.e., to a theory]. This process, which is fundamental to modern science, was practiced by the Arabs a thousand years ago. It was the key to ibn al-Haitham's success in particular.

Raziuddin Siddiqi has quoted the following statement by Robert Briffault: "The debt of our science to that of the Arabs does not consist in any startling discoveries of revolutionary theories; science owes a great deal more to Arab culture, it owes its existence. The Greeks systematised, generalised and theorised, but the patient ways of investigation, the accumulation of positive knowledge, the minute methods of science, detailed and prolonged observation and experimental enquiry, were altogether alien to the Greek temperament. What we call science arose in Europe as a result of a new spirit of enquiry, of new methods of investigation, of the methods of experiment,, observation and measurement, of the development of mathematics in a form unknown to the Greeks. That spirit and those methods were introduced into the European world by the Arabs".

Kamal Mohammad Habib has noted that Aristotle was a performer of experiments, as were Theophrastes and Archimedes, but that Greeks in general inclined towards teleology. Phenomena concerned them far less than 'noumena' (a noumenon is "an object of inuition by the reason or understanding, as something transcending perception through the senses: opposed to phenomenon" [Britannica World Language Dictionary]).

Ar-Razi and ibn al-Haitham both used the inductive approach; its transmission to Europe probably owes most to ibn al-Haitham whom Roger Bacon borrowed from and whose works he may even

have read in the original Arabic, and whom the Pole, Witelo Ciolek, relied on extensively for his work on optics.

Called "doctor mirabilis" or wonderful teacher, Roger Bacon was born about 1220. Himself a polymath, he was an exponent of experimental science. "T. Cr.", in the Encyclopaedia Britannica notes, "Bacon therefore represents a historically precocious expression of the empirical spirit of experimental science, even though his actual practice of it seems exaggerated." The fact that the writer deems Bacon to be precocious unfortunately betrays the continuing ignorance of the West of its Arabic debt with respect to such an approach to science.

Ibn al-Haitham himself has written, "We shall initiate experiments afresh on the primary and basic characteristics of the problem which we propose to investigate."

Apropos this, Naseer Ahmad Nasir has noted, "the greatest contribution of Muslim scientists to the study of science in the West is the introduction of inductive method and the realization of its importance. Among these scientists, ibn al-Haitham stands at the top of the pyramid".

That he must have been an engineer of some standing would seem to follow from his writings on the control of the Nile. He is known to have designed a water clock. Besides the subject of optics, in which he was a pioneer and which he developed by a combined physical and mathematical approach, he calculated the weight of the atmosphere and its density and observed how the weight of objects varied when they were suspended in materials of differing density. He saw gravity as a force.

We have already mentioned that ibn al-Haitham was called the "Father of Optics". His findings were based on experimental evidence. He saw objects as being either luminous or non-luminous. Luminous bodies emit light which derives from them (e.g., the sun, a star, a candle). Non-luminous bodies were seen as not emitting

light; light could, however fall upon them. Its behaviour then depended on the type of non-luminous body it was. He classified bodies upon which light falls into three classes, those which were:

1. *Transparent (e.g., space, air, water, glass)*
2. *Semitransparent (e.g. muslin - sheer, loosely woven cloth)*
3. *Opaque (e.g., a stone)*

He was the first to clearly state the second law of reflection (the incident ray, the reflected ray and the normal all lie in the same plane). In further work on catoptrics (the science that deals with mirrors and reflections from them), he developed an equation of the fourth degree i.e., with 'x' to the fourth power [$x^{(4)}$] to provide a solution to a problem which has acquired the name 'Alhazen's Problem': "in a spherical concave or convex, a cylindrical or conical mirror, to find a point from which an object of a given position will be reflected to an eye of given position". He worked with spherical and parabolic mirrors. He also is credited with the discovery of spherical abberation ["the failure of a lens or mirror to bring all light rays to the same focus": Britannica World Dictionary], and with its description. The early problems with the Hubble space telescope were caused by its mirror being affected by spherical aberration.

He likewise studied refraction ("when light is refracted from air into water, the angle which the incident ray makes with the normal is always greater than the angle which the refracted ray makes with the normal"). He noted that, up to 20 degrees the ratio of the angle of incidence to the angle of refraction was about 1.3 (i.e., a constant). Based on his observations, he drew a series of tables relating the two. He made use of his findings on refraction to explain the apparent increase in the angle of elevation of celestial objects above the horizon; he also used this as an explanation of the apparent increase in the size of the sun and the moon when they were close to the horizon.

He showed that light is transmitted in a straight line, irrespective of the medium through which it passes, and that it is a form of heat energy (which he inferred from observing the kindling effect of a focussing lens and the warming of any body which sunlight irradiates).

He showed that luminous bodies were the source of light. He correctly argued that the stars are luminous bodies; he incorrectly argued that the moon and the planets were also luminous bodies.

He showed also that an object was not perceived because a ray issued from the observer's eye (the Greek theory), but rather that it was perceived because a ray of light was reflected from (or in the case of a luminous body, issued from) the observed object and entered the eye of the beholder. Ibn Sina and al-Biruni did likewise.

The 'camera obscura' was described and used by al-Haitham. This is a light-proof box with a pin-hole in it with or without a lens fixed into the hole. Light from an object passes through the hole and the object's image can be projected in colour upon a flat surface within the box. Al-Haitham used a room as a camera obscura. Light from the sun passed into the room through a pin-hole in the closed shutters, and the sun's image was displayed on the opposite wall. He noted that the image was inverted.

He showed that twilight began or ended when the sun fell to 19 degrees below the horizon and he calculated the height of the atmosphere at 52,000 paces. (J. Vernet: Encyclopaedia of Islam). He attributed the colour of the sky to light dispersion.

He discussed the physiology of vision based on his observation of the anatomy of the eye. G. A. Russell has noted that ibn al-Haitham's anatomical approach was the "first effort to quantitatively define the biconvexity and the forward position of the 'lens' as well as the optical axis in strictly anatomical terms, i.e., with reference to the proportional relationship of the structure of the

eye. What emerges is the eye, considered in terms of the segments of two globes, one large and one small, intersecting eccentrically"

"Moreover, he investigates the functional significance of the parts of the eye (the constancy of their relationship, their position, distance, transparency and opacity) as an optical system to allow the passage of light and colour for image-formation according to the principle of corresponding points."

Al-Haitham's output of written works exceeded two hundred titles, of which the following form a small sample (from Usaybi'a via Leclerc):

Commentary on Euclids Elements of Geometry
Commentary on Ptolemy's 'Almajest'
Light, according to Euclid and Ptolemy
Elements of Geometry
The azimuth of the Qibla, with tables
Poetry, from an Arabic translation of Greek
Music, and its effect on animals
The world, its origin, its nature and its perfection
On pain and pleasure
On sperm
On the voice
Properties of simple medicines
Properties of compound medicines
On good and bad chyme
That the qualities of the soul follow temperament
On bad temperament
On the use of bleeding
On marasmus
On the best constitution
On foods, according to Hippocrates and Galen
On light, in seven books
The practice of astronomical observations

On aspects of stars
On the movement of the moon
Description of eclipses
On optics, according to Ptolemy

His great work on optics is "Kitab al-Manazir". It was translated into Latin, possibly by Gerard of Cremona, and printed in 1572 A.D. by Risner of Basle under the Latin title, "Opticae thesaurus Alhazeni libri VII, cum ejusdem libro de crepusculis et numium ascensionibus". In its Latin form it extends to more than 1000 pages, in seven chapters. The Arabic original was long thought to have perished, but Hameed Askari reported several years ago that 2 handwritten copies had been discovered in Istanbul at the al-Fateh and Topkapi Sarai libraries by Mustafa Nazif Bey. Askari's son-in-law, Ahmad bin Muhammed bin Jafar al-Askari made a copy of the same. The Arabic text extends to 1090 pages. The Hamdard National Academy of Pakistan possesses a microfilm copy of the work.

Roger Bacon was unstinting in his expression of admiration for ibn al-Haitham's work.

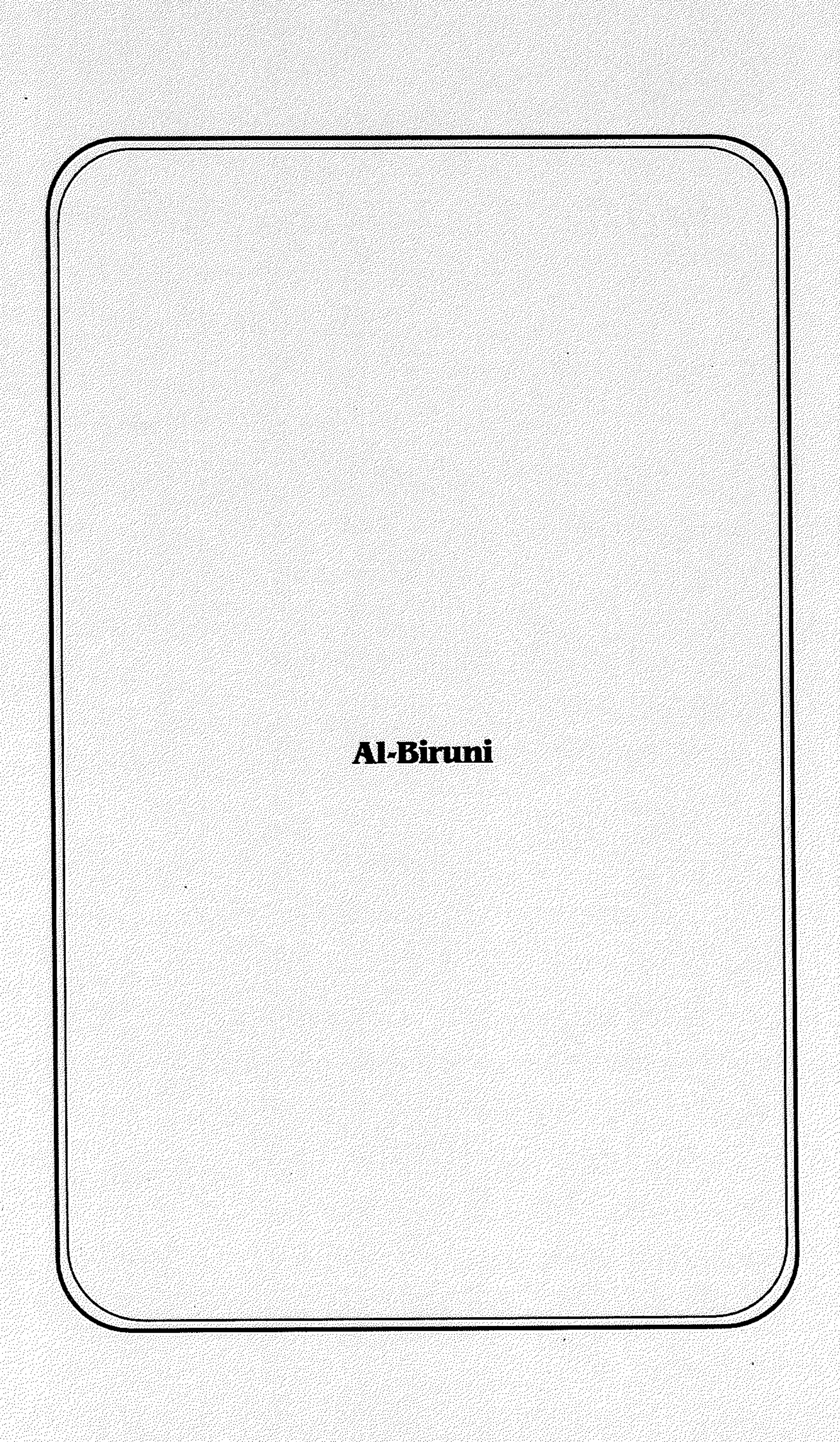
Witelo Ciolek drew heavily on this particular work in composing his own, "Perspectives". Lucien Leclerc suggests that Witelo was not as frank as he might have been in acknowledging the extent of his debt to ibn al-Haitham. Leclerc is not convinced that Witelo or another person named Ramus were involved in the translation of ibn al-Haitham, and he observed that Witelo cited al-Haitham but rarely in his own work. Because he had access to a double edition containing Witelo's "Perspectives" and ibn al-Haitham's Kitab al-Manazir", he was able to cast some light on the extent of Witelo's indebtedness: [translation] "Well, it is precisely this comparison - easy to make in the double edition - that proves how much Witelo owes to Alhazen. Risner took care to note all the borrowings. He

recognises them in his dedication to Catherine of Medici, while according Witelo the merit of having produced a better executed and more complete work than that of his predecessor.......Witelo then only rebuilt and embellished the structure begun by Alhazen, from whom he borrowed his material. Besides, Witelo himself, in his dedication to William of Morbeka makes it clear that he proposes as his aim to reproduce the work of his predecessors more methodically."

A commentary on this work was written by Kamaluddin Farsi in 1320. It was called, "Tanqih al-Manazir". It was republished in 1928 in Hyderabad

Another work by him, "Fi Surat al-Kusuf" describes the use of the camera obscura in solar eclipses (Vernet).

Unhappily, in the 13th century, ibn al-Haitham was accused of heresy, and many of his books were burnt. This was, of course the century of the catastrophic Mongol invasion in which Baghdad itself fell. The fact that his likeness graces a commemorative stamp issued by the postal services of Pakistan where he is named as the 'Father of Optics', as well as the Iraqi ten dinar note is a small indication of how esteemed he is in the Muslim world of today. The West and the world in general are very much in his debt.



Al-Biruni



البيروني

Al-Biruni (The Master)

[973 - 1050]
(Abu Al-Rayhan Mohammed ibn Ahmed al-Biruni al-Khwarizmi)

"Minds have a pressing need for expanding their domains of activities, and souls cannot be satisfied without spiritual contemplation. Hence it is my ambition to present what passes through my mind concerning the creation of an art, or the perfection of the projected shadow of knowledge; so that on beholding it, the mind shall see the shadow most beautifully clothed, and shall find in it the satisfaction which is inspired by its virtues of permanence for all time. Whoever succeeds in such an achievement is a man of admirable character, and has the virtues of excellence (both) relatively and absolutely." (al-Biruni, translated by Jamil Ali in "The determination of the coordinates of cities")

It was not simply a fortuitous accident that Mesopotamia became a centre of power very early on in the era of the expansion of Islam. As part of the "fertile crescent" by virtue of the presence of two great rivers, the Tigris and the Euphrates, it possessed a rich soil which allowed the growing of food crops in abundance, and this in turn made possible the development of large permanent centres of population and the consequent evolution of strongly rooted civilisations. The Caliphs in Baghdad used the fertility of the land of Mesopotamia and the solid infrastructure of civilisations which had preceded them there to spread the Empire of Islam from the Atlantic Ocean in the West to beyond the Aral Sea in the East. The spirit of Islam in the minds of Muslims was the driving force; the earth of Mesopotamia went a long way towards sustaining their bodies.

The word, Mesopotamia, is derived from two Greek words, 'meso' meaning between and 'potamia' meaning river. Mesopotamia is the land 'between the rivers' - in this case, between the Tigris and the Euphrates, as has been mentioned. Its rich soil is the gift of these rivers.

C. E. Bosworth has noted the similarities between Mesopotamia and the land between two rivers flowing into the Aral Sea, the Oxus (Amu Darya) and the Jaxartes (Syr Darya), - another 'Mesopotamia' - and has used this to explain the presence in the tenth and eleventh centuries of a genius such as al-Biruni in a region which certainly wasn't at the centre of the Islamic world.

As with Mesopotamia, the area between the Oxus and the Jaxartes has a rich soil which encouraged the development of agriculture. Very early on, the region was subjected to central direction by the state, with a well ordered irrigation system and planned agriculture. Even in the time of Alexander the Great (356 B.C. - 323 B.C.), the state was sufficiently strong for its ruler, Pharasmanes, to visit Alexander with 1500 cavalrymen, and to claim sovereignty over the whole area from Chorasmia (Khwarazm) to the shores of the Black Sea.

The region, a part of Transoxania ("Beyond the Oxus"), was called Khwarazm in the time of al-Biruni, and much of what is known about it now comes from writings by him such as 'History of Khwarazm' and 'Ruins from past centuries' ['Al-Athar al-baqiya 'an al-qurun al-khaliya']. Khwarazm would seem to have actually extended along both banks of the Oxus. Its name may have derived from two old Persian words, "Khwar", meaning 'low' and "zamin", meaning 'land'. Three major cities are known to have existed, Kath, Jurjanj and Hazarasp. According to Z. Safa and Bosworth, al-Biruni set the date for the beginning of civilization in Khwarazm in 1292 B.C. when Siyavush began the Siyavushid dynasty which was to endure until Afrigh became Khwarazmshah (ruler) in 305 A.D. and founded the Afrighid dynasty which in turn lasted till 995 A.D.

Although the region was attacked by Islamic generals in 651 and 681 A.D., it was not conquered until Qutaiba bin Muslim invaded in 712 A.D. and was able to take advantage of a civil war involving the ruling Khwarazmshah and his brother to take effective control. Bosworth notes that Khwarazm did not become a truly Islamic region for a further three generations. However, that still means that Islam was established there some 250 years before the birth of al-Biruni. Still an Islamic region, Khwarazm (Khiva is a modern term for it) is now part of Uzbekistan and Turkmenistan.

During the period in which we are interested, the area changed rulers several times. The Samanid dynasty occupied Transoxania and Khurasan as far west as Ray (close to modern Teheran) from 874 till 999. The 'Iraq' family ruled in the Khwarazmi city of Kath as nominal vassals to the Samanids, but in 922, the Ma'munid dynasty ruling in the neighbouring city of Jurjanj threw off Samanid control. The last king of Kath, Khwarazmshah Abu Abdulla, was killed in 995, and the Ma'mun family then took over there as well, ruling from Jurjanj, the second city of Khwarazm. In 1017, an assassination of the last Ma'munid ruler, Ma'mun ibn Mahmoud, led to an invasion by Mahmoud ibn Sebuktigin, the ruler of Ghazna (now part of Afghanistan) His father (Sebuktigin) had been a Turkish slave who had risen to become ruler of Ghazna in 977. Mahmoud extended his dominion until it covered most of Iran (including what is now part of the former Soviet Union) and Pakistan (including Kashmir), and he made Ghazna a centre of science, art and culture which rivalled Baghdad. As we shall see, it was Mahmoud's preoccupation with India that led al-Biruni there. The Ghaznavids held power until 1040, when they in turn gave way to the Seljuks.

Despite the political confusion of the times, the civilization of Khwarazm had reached its apogee at the time of al-Biruni's birth, and there were important Islamic centres of both science and logic in the country. Science was particularly popular during al-Biruni's youth.

To sum up briefly, al-Biruni was born into a well established Islamic culture capable of fostering his genius and of giving him ample opportunity to use it productively.

Abu al-Rayhan Mohammed ibn Ahmed al-Biruni al-Khwarazmi is said to have been born in 973 A.D. (on the 4th of September!) on the outskirts of the city of Kath. The latter information is used by some to explain his name, "al-Biruni", as deriving from the word, 'biruni', meaning 'exterior' (as opposed to 'duruni' meaning 'interior') in the language used there at the time (Z. Safa). Leclerc states, however, that it derives from the name of an Indian city he visited. He was taught by the mathematician, Abu Nasr Mansur bin Ali bin Iraq Djilani who was the "favoured friend of the caliph of Islam", and by Abd al-Samad al-Hakim (a peripatetic philosopher). He became multilingual; Z. Safa credits him with a knowledge of 'some Greek', Hebrew, Syriac, Sanskrit (learned later on in life), Persian and literary Arabic. Because he is known to have been fluent in Turkish in his infancy and youth, Mubahat Turker-Kuyal feels that his maternal language must have been a regional variant of Turkish and, hence, that he must have derived from Turkish stock. However, it has also been suggested that his deep knowledge of Hebrew and Jewish literature might indicate Jewish origins!

His writings were predominantly in Arabic, this being his personal preference. Other fields in which he excelled later include history, mathematics, astronomy, astrology, jewellery, geology, geodesy, medicine and pharmacology. He was to a considerable degree self-taught, with much of what he learned coming from personal research as well as personal practical work. His intellectual accomplishments earned him the name, "al-Ustath" (the Master).

He was seven years older than Ibn Sina, and the two corresponded extensively, particularly on the field of philosophy. There were some disagreements between the two during this

correspondence chiefly because Ibn Sina took exception to being told by Al-Biruni that some of his ideas were incorrect. The former is said to have allowed his students to read out Al-Biruni's letters in a manner which tended to belittle him.

When he was still only twenty or so, Kath fell to the Ma'munids, and he was forced to flee from his birthplace, first going to Khurasan and then to Ray, where he spent two or three years in some misery, moving on from there to Mazandaran (south shore of the Caspian Sea). In 999, his fortunes began to improve. He joined the court of the Amir Qabus bin Washmgir Shams al-Ma'adi, and was able to continue his work there in Jurjanj. Safa notes that he finished his book, 'Al-Athar al-baqiya 'an al-Qurun al-khaliya', at this time. In a further move, he returned to Khwarazm, now ruled by the tolerant and intellectual Abu al-Abbas Ma'mun. This was the beginning of a period of security for al-Biruni which was to last till 1017 A.D. Ma'mun was much impressed by him and he became both Ma'mun's friend and his state counsellor for the last seven years of the ruler's rule.

This period ended suddenly, and a new and possibly more productive time began for al-Biruni when Ma'mun was assassinated in 1017. The ruler of a neighbouring state, Ghazna, the Sultan Mahmoud bin Sebuktigin, used the situation to take over Khwarazm, and with Khwarazm, he seized as well the intellectuals who had been in Ma'mun's court there. It would seem that of them all he prized al-Biruni most highly. They were all moved to Mahmoud's capital, Ghazna in what is now Afghanistan. The sultan Mahmoud's power continued to grow until it approached that of the Abbasids in Baghdad, but he pledged nominal fealty to Baghdad, and Baghdad allowed him to remain the real power in the East; a period of security began which was only disturbed with the arrival of the Seljuks.

Mahmoud had a great interest in India, and he made almost yearly military visits to it, taking al-Biruni with him. This preoccupation on Mahmoud's part was to open the science and philosophy of India to Islam. It was the time when al-Biruni was able to master Sanskrit and develop a very deep understanding of the knowledge of the Indians. His later passing on of this knowledge to Islam may perhaps be his most significant intellectual contribution. F. C. Auluck considers that he spent about ten years in India in all.

Sultan Mahmoud died in 1030, and al-Biruni then served at the court of his successors, Mohammed, (ruled a few months only), Mas'ud (1030 - 1040), and Maudud (1040 - 1048). The date for his death is not as certain as that for his birth. Safa puts his death at 1048, but others have claimed he was still alive in 1055. He himself noted towards the end of his life when he was working on his pharmacology book that he was over eighty (lunar) years of age; he must therefore have lived till at least the age of 78 (Gregorian calendar). The consensus seems to be that he died 'after 1050'.

Of al-Biruni's written works, two are of especial interest, dealing as they do with the field of medicine. The first in importance (but the last to be completed) is his 'Kitab al-Saydana', a work on pharmacology. This was designed as a counterpiece to a previous book written by him on precious stones. He is known to have had a continuing interest in this work over almost the whole of his life, and to have added to it considerably as a result of his trips to India. In preparing the text, he had the assistance of one of his best disciples, Hamid Ahmed ibn Mohammed al-Nasha'i. Al-Biruni later added explanatory notes in the margins and between the lines. Unfortunately, from the point of view of discerning what comes from al-Biruni and what comes from others, a singular difficulty comes from his copiers also having done the same when they added their comments. Some of them even integrated their statements into the text!

Anawati quotes al-Biruni on the meaning of Saydana: "It is that which professes to collect medicines in their best form, to experimentally verify the best types whether they be simple or compound, according to the formulae passed on by the most celebrated doctors." He considered pharmacology to be the gateway to medicine.

There is a copy of the work in the British Museum (MS or. 5849) which contains 176 pages, with 24 lines per page. This had been found by H. Beveridge in 1899. At least three Arabic copies and one Persian one (translated by Abu Bakr ibn Ali ibn Othman Ashfar al-Kasani in 1228) exist. In one found in the library of Qurshunlu Jami (an Arabic original) there is a twenty page introduction followed by the main body of the text. In the work, al-Biruni notes that the Arab language is a language of science, which does not, however, lend itself to the transcription of foreign words. He notes his displeasure at the many errors he has found in the then available polyglot dictionaries. He also includes reminiscences on his times in India. Of this manuscript, there are two copies in Baghdad and one in Cairo.

Drugs are discussed from the medical point of view, and their medicinal characteristics are noted. Those cited are animal, vegetable or mineral in derivation. In a philological passage for each drug, alternative names in some twenty languages (including Greek, Syriac, Persian, Indian, Hebrew, Khwarazmi and Balkhi) are listed, and the differing views of his sources are put forward. Manfred Ullmann notes that al-Biruni also cites many verses of old and modern Arabic poetry which include references to the drug in question, and he notes their origins, nature and adulteration. Among his sources is a book written to Cleopatra, who is credited with medical skills in her own right. Other authors he cites include Aristotle, Dioscorides, Aetios of Amida, Paul of Aegina, Yahya al-Bitriq, Ayub ar-Ruhawi, al-Kindi and ar-Razi (ar-Razi is cited 255 times). Georges Anawati has

counted 61 different authors cited in the work. He has also given 1197 as the number of entries - although some are synonyms. Manfred Ullmann's count is 850. Hakim Mohammed Said states that about 700 drugs are dealt with in al-Saydana (as opposed to 972 listed by Ibn Sina). He considers al-Biruni's work to be superior to those of Ibn Sina and Harawi on the subject.

His gratitude to the ancients and Dioscorides in particular is emphasised in the following statement by him quoted by Fuat Sezgin: "Under the Greeks, and before Christianity, there were men who were distinguished by their outstanding zeal for research and their endeavours to advance things to the utmost degree, and bring them close to perfection. If Dioscorides had lived in our latitudes, and had expended his efforts in them to understand the plants of our mountains and valleys, they would all have been made into medicaments, and their fruits would have become medicines through his fundamental practical knowledge. Nevertheless, through him and others like him, the West carried away the prize and by their strivings, which are so worthy of our gratitude, it has brought to us scientific and practical usefulness." To al-Biruni, the West was presumably Greece and other places which had been hellenised.

Anawati states that to al-Biruni, the two tasks a pharmacist should be competent to perform are the suppression of the product in a compound medicine without abolishing the principal action and the substitution of a particular medicine by another which is more or less equivalent where the first cannot be obtained. Iskandar notes that, according to al-Biruni, a pharmacist should be able to recognise the genera and species of plants giving simple medicines and should have a knowledge of the principles of compounding drugs.

Besides being a first class work in itself, al-Biruni's passion for recording the views of earlier writers in it has saved much material that appeared in works destroyed by Hulago's hordes when Baghdad was overrun in 1258.

The second book written by al-Biruni of interest to those in the field of medicine is his, 'Fihris Kutub Mohammed bin Zakariyya ar-Razi' (an index of the books of ar-Razi). This is based on the works of ar-Razi which al-Biruni examined personally, and it was written at the request of someone who was fascinated by ar-Razi, who also asked him to add his own (al-Biruni's) bibliography at the end of the work. It is said to have been compiled during the reign of the Sultan Masud bin Mahmoud (1030 - 1040). Ar-Razi's works were classified according to subject matter - an innovation on the part of al-Biruni. In it, al-Biruni argues that what he considered ar-Razi's heretical religious philosophy should not stand in the way of an appreciation of his great medical accomplishments. He also adds his own opinions on the origins of the medical sciences. In addition he added information on works by three of his contemporaries who had dedicated their works to him. This book was finished when the author was about 65. It was published in modern times by Paul Kraus in 1936.

It is said that al-Biruni decided to write his 'Kitab al-Saydana' after evaluating ar-Razi's two works, 'Saydanat-at-Tib' and 'Abdal al-Adawiya' which he deemed inadequate.

Al-Biruni's book, 'Fi Tahqiq ma lil Hind', (On the affirmation of what is in India) is of interest to everyone, recording as it does the times and customs of the people he met on his many trips to the sub-continent in the retinue of the sultan Mahmoud. One stimulus to the writing of his book on India was the attitude of Abu Sahl at-Tiflisi, who urged him to write down all he knew. Fuat Sezgin quotes al-Biruni: (translation) "In the East, there is no people which tends towards science except for the Indians. But in these subjects (i.e., medicine) they have laid down a very secure foundation which contrasts with the usual rules of the western lands. Moreover, contrasts are made prominent between us and them in language, religion, manners and customs, while their extreme scrupulousness with regard to cleanness underlines the similarities."

Auluck notes that in addition to its being a work on the science of India, Fi Tahqiq ma lil Hind is also a comparative study of Indian, Persian, Greek and Arabic thought.

It would be profitable to digress at this point and interject a brief description of Indian medicine and of the art of surgery in particular as described by the Indian surgeon Sushruta and to a lesser extent by the physician, Caraka.

What follows derives from the English translations of the Sushruta Samhita of Kaviraj Kunjalal Bhishagratna. and of the Caraka Samhita of P. V. Sharma. The word, Samhita, means a collection [of writings].

Sushruta

Most evidence now points to Sushruta having lived and worked in the sixth century before Christ. He was predominantly a surgeon, a man of the race of Vishvamitra and therefore a Brahmin. For any other information on Sushruta, one must read between the lines, so to speak, in the Samhita. This in itself is a hazardous undertaking, because one can never be sure that what one is reading comes from the pen of Sushruta. According to Kunja Lal, "we have no means of ascertaining what the Samhita was like as originally written by Sushruta, the present being only a recension, or rather a recension of recensions, made by Nagarjuna". He further explains the almost total absence of any information on the man himself by noting that "In a country like India where life itself was simply regarded as an illusion, the lives of kings or commoners were deemed matters of little moment to the vital economy of the race."

Although the claim is made by the ancient Aryans that their knowledge of medicine (and other matters) derived from the gods by direct revelation, as Kunja Lal points out, Indian Medicine is probably the outcome of collecting and organising the knowledge of individuals over eons.

In the first part of the Samhita, Sushruta describes the Ayurveda (the science of life) as being divided into eight branches:

The eight branches of Ayurvedic Medicine

1. Salya-Tantram - Treatment of ulcers, removal of foreign bodies; in short, surgery, cautery and the use of alkaline substances.
2. Shalakya-Tantram - diseases etc. occurring above the clavicles
3. Kaya-Chikitsa - general diseases (not restricted to any particular organs) [e.g., fever, dysentery, haemoptysis, insanity, hysteria, leprosy, unnatural discharges from the urethra, etc.
4. Bhuta-Vidya - Demonaical diseases (exorcism of evil spirits, etc)
5. Kaumara-Bhritya - paediatrics (also treatment of mothers' milk etc.)
6. Agada-Tantram - toxicology; treatment of bites from snakes, spiders, venomous worms and their characteristic symptoms and antidotes; elimination of poison whether animal, vegetable or mineral (resulting from incompatible combinations) from the system of a man overwhelmed with its effects.
7. Rasayana-Tantram - the prolongation of human life, invigoration of memory and the vital organs of man. It deals with recipes which enable a man to retain his manhood or youthful vigour up to a good old age, and which generally serve to make the human system invulnerable to disease and decay.
8. Vajeekarana-Tantram - science of aphrodisiacs "in short, it deals with things which increase the pleasures of youth and make a man doubly endearing to a woman"

Surgery is given pride of place in medicine as being the oldest of its branches and the one which has the advantage that "instantaneous actions can be produced with the help of such appliances as, surgical operations, external applications of alkalis, cauterisation, etc. and secondly inasmuch as it contains all that can be found in the other branches of the science of medicine as well".

It is perhaps not surprising to read in Sushruta's Samhita that when the disciples of the holy Dhanavantari, incarnated in the form of Divodasa, king of Kasi, were invited to choose that part of the Ayurveda they wished to be taught, they chose surgery, and they further elected Sushruta as their spokesman..

There were three 'physiological factors' or Doshas which control the body:

The Vayu **[nerve force]** - Bishagratna states that it is "the primary cause - an all-in-all that governs our organic as well as our cognitive faculties". It maintains the necessary balance between the effects of Pittam and Shleshma.

The Pittam **[internal fire]** - Kunja Lal equates it to the idea of metabolism current in 1907 when he performed the translation. Perhaps it might for the most part correspond to catabolic processes.

The Shleshma or Kapham **[the cooling principle]** It is seen as the factor responsible for counteracting the effects of Pittam which, uncontrolled, would lead to the body's being consumed. This might be equated with anabolic processes.

Food which is "ingested is fully digested with the help of the internal heat and ultimately assimilated in the system, giving rise to lymph chyle and forms the essence of the assimilated food." During its progress throught the body, its colour is changed by the normal heat of the body, and it becomes blood. He notes that the 'seats' of

blood are in the liver and the spleen. "Blood is the origin of the body. It is the blood that maintains vitality. Blood is life. Hence it should be preserved with the greatest care."

Blood causes the formation of flesh, and flesh in turn produces fat which then contributes to bone formation. This then leads to marrow being produced; marrow causes the formation of semen.

Disease is defined as follows: "The Purusha (man) is the receptacle of any particular disease, and that which proves a source of torment or pain to him is denominated as a disease."

There are four types of disease:

Four types of disease

Agantuka - Traumatic (of extraneous origin) - [i.e., a blow or hurt]

Sharira -Bodily [diseases due to irregularities in food or drink, or incidental to a deranged state of the blood, or of the bodily humours acting either singly or in concert]

Manasa - Mental [excessive anger, grief, fear, joy, despondency, envy, misery, pride, greed, lust, desire, malice etc.]

Svabhavika - Natural [hunger, thirst, decrepitude, imbecility, death, sleep, etc.]

The treatment of disease is based on four factors, cleansing, pacification of whatever imbalance is causing the disease, and proper management of diet and conduct.

Chapter 38 of the Samhita concentrates on drugs and categorises them according to their therapeutic effects. there are 37 categories. Many have differing effects on the three physiological factors, Vayu, Pittam and Kapham; others are more specific. For instance some destroy fat, combat dysentery, cure stones in the

bladder, cure leprosy and correct seminal disorders. The following chapters go into much detail on particular groups of drugs.

Sushruta was obviously a practised surgeon, and a man who used dissection to acquire the knowledge necessary for such a profession despite the religious rule that required the cremation of any body greater than two years of age. He wrote, "The different parts or members of the body as mentioned before including even the skin cannot be correctly described by any one who is not versed in anatomy. Hence, any one desirous of acquiring a thorough knowledge of anatomy should prepare a dead body and carefully observe (by dissecting it) and examine its different parts."

His instructions for the preparation of such a body - leaving it to decompose in water for 7 days - might however be considered counterproductive. He did however instruct that the intestines be evacuated and that they be wrapped in grasses and the like. Perhaps there was also something else included which has not been written down.

Bishagratna quotes Sushruta as follows concerning the need for practical experience: "theory without practice is like a one-winged bird that is incapable of flight".

He deals with cautery and the use of alkalis which seem to be equivalent to surgery, although less radical. With respect to the latter he writes: "An alkali administered by an ignorant physician is to be dreaded more than poison, fire, blows with a weapon, thunderbolts, or death itself; while in the hand of an intelligent physician it is potent enough to speedily subdue all serious diseases in which its use is indicated"

He states that the use of leeches is the gentlest type of bleeding that can be devised and advocates its use for those not strong enough to undergo surgery.

He divided surgical procedures into eight categories:

incising	*excising*
scraping	*puncturing*
searching or probing	*extracting*
secreting fluids	*suturing*

Sushruta states that there are 101 surgical instruments, normally made of iron, of six types and designed to the aims of the 8 procedures listed above. He states that the following are commendable features in such instruments: "Instruments that are fitted with handles of easy grip and made of good and pure iron, well shaped, sharp, and are set with edges that are not jagged and end in well formed points or tops should be deemed the best of their kind." He abjures the surgeon to design his own to fit the circumstances.

Amongst the surgical procedures described are the following:

removal of bladder stones	*rhinoplasty*
'couching' of cataracts	*amputations*
treatment of wounds	*caesarian section*
fistula repair	*splinting of fractures*
removal of arrows etc.	*midwifery*
treatment of ascites	*extraction of dead foetus*

As a final comment on the Sushruta Samhita, one cannot help but be perplexed by the propensity of the translator to decline to use English equivalents for much of the subject matter. Would that I knew a bit of Sanskrit!

Caraka

As an individual, Caraka seems, if anything, more nebulous than is Sushruta. He is considered by many to have possibly been assigned to a line of savants all of whom worked on the topic of Ayurvedic medicine. V. P. Sharma argues that he probably lived between the fifth century B. C. and the second century A.D.

G. Morgenstierne sees al-Biruni as a pioneer in the comparative study of human culture. He quotes al-Biruni as follows: "I like to confront the theories of one nation with those of another simply on account of their close relationship, not in order to correct them."...."The mutual assistance of civilised people presupposes a certain difference among them in consequence of which one requires the other. According to this principle, God has created the world as containing many differences in itself." As A. Bausani points out in contrasting the approach of al-Biruni with that of Ibn Rushd to the Christian concept of the Trinity, "the scientist (Biruni) tries to understand objectively (apart of his theological judgement) what the Christians mean by Trinity, the philosopher (Ibn Rushd) tries to teach the Christians what they should mean by Trinity!" By this I understand that al-Biruni's approach is the superior one because it unshackles him from the "one-way vision" of the missionary (who may see an act on the part of someone from another culture as unacceptable because if he - the missionary - were doing it its significance to him would make it unacceptable) and frees him to search out the true meaning of whatever he is studying.

He did abhor the "hideous fiction and superstitions of the Hindus", but at the same time he realised that the Hindu lower castes were in fact barred access to the Veda. There was one religion for the intellectuals and another for the untutored.

He is known to have translated Indian works into Arabic, one such being the 'Kalab yarah' on septic diseases.

Other works for which he is admired include his book on precious stones, which includes their medical uses. It also has comments on their natural history, and business and industrial aspects. Coral, diamond. porcelain and copper are also covered. The book was considered a companion to his 'Kitab al-Saydana'. He wrote two treatises on the fabrication and use of the astrolabe, a

book, 'The determination of the Co-ordinates of Cities' with a treatise on the Qibla (determination of the direction towards Mecca from different points), an introduction to astronomy and a work on the correction of language.

Like al-Kindi before him, al-Biruni was an eminently practical man as well as an intellectual. Al-Hassan and Hill mention him several times in their 'Islamic Technology: an Illustrated History'. He constructed an astrolabe and a geared mechanical calendar. He described in his writings how water power was used in the paper mills of Samarkand, and how a similar technology was applied to the refining of gold. Further purification by amalgamation with mercury was also described. He was also interested in the production of iron and steel, and noted the qualities of cast iron: It is quick to flow like water when iron ores are smelted; it is hard and silver-white in colour; it cannot be forged; it is brittle; it can be mixed in crucibles with wrought iron to make steel.

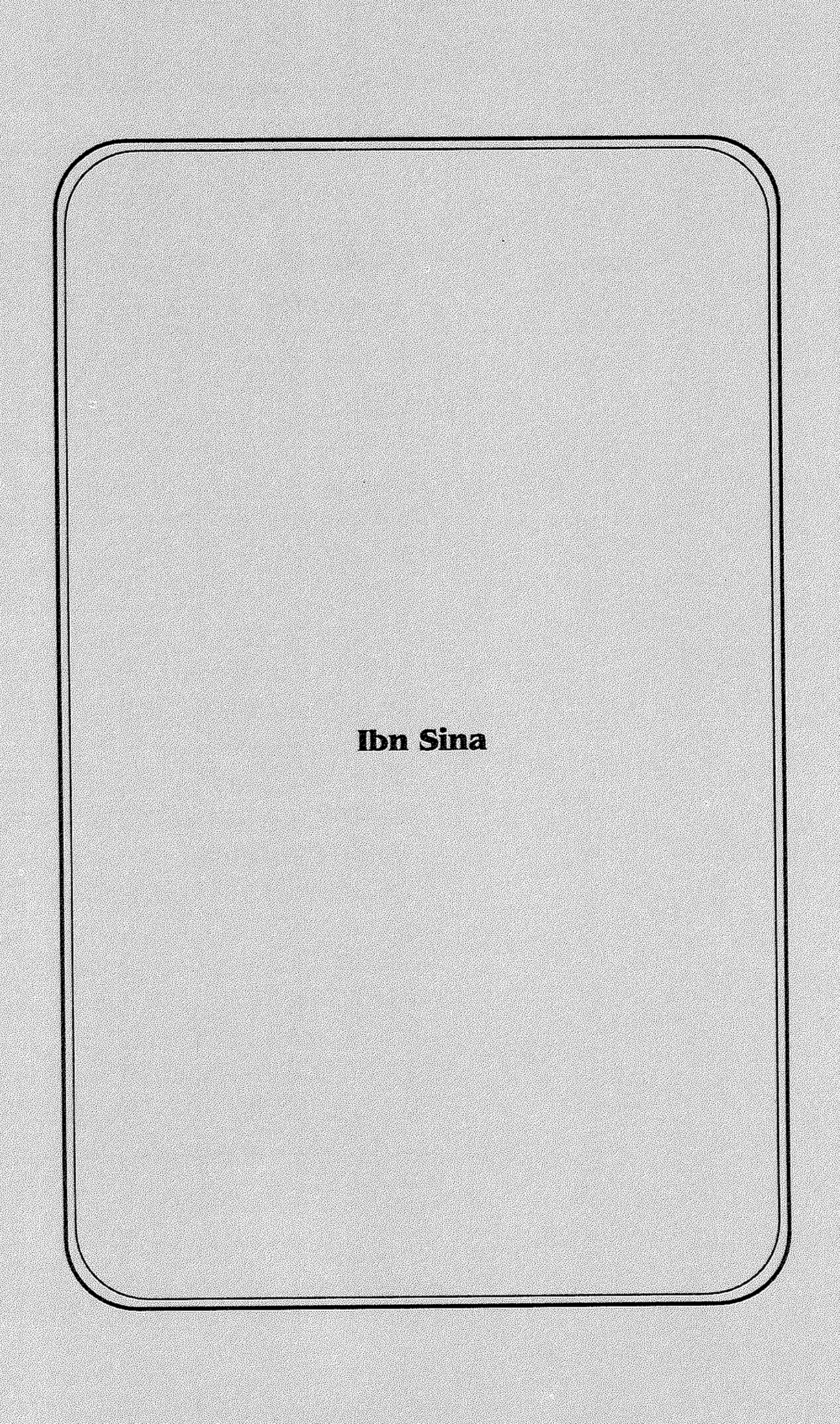
He has described the use of a pottery kiln for preparing the frit needed for glazing, and he provided a recipe for such a frit made from quartz, potash and a crude form of borax.

Al-Hassan and Hill quote the following from al-Biruni on the mining of the ruby: "The search for La'l (a kind of ruby) is of two kinds; one is to dig the mine under the mountain, and the other is to search for it among the gravel and earth which result from the collapse of mountains by earthquakes or from their erosion by floods."

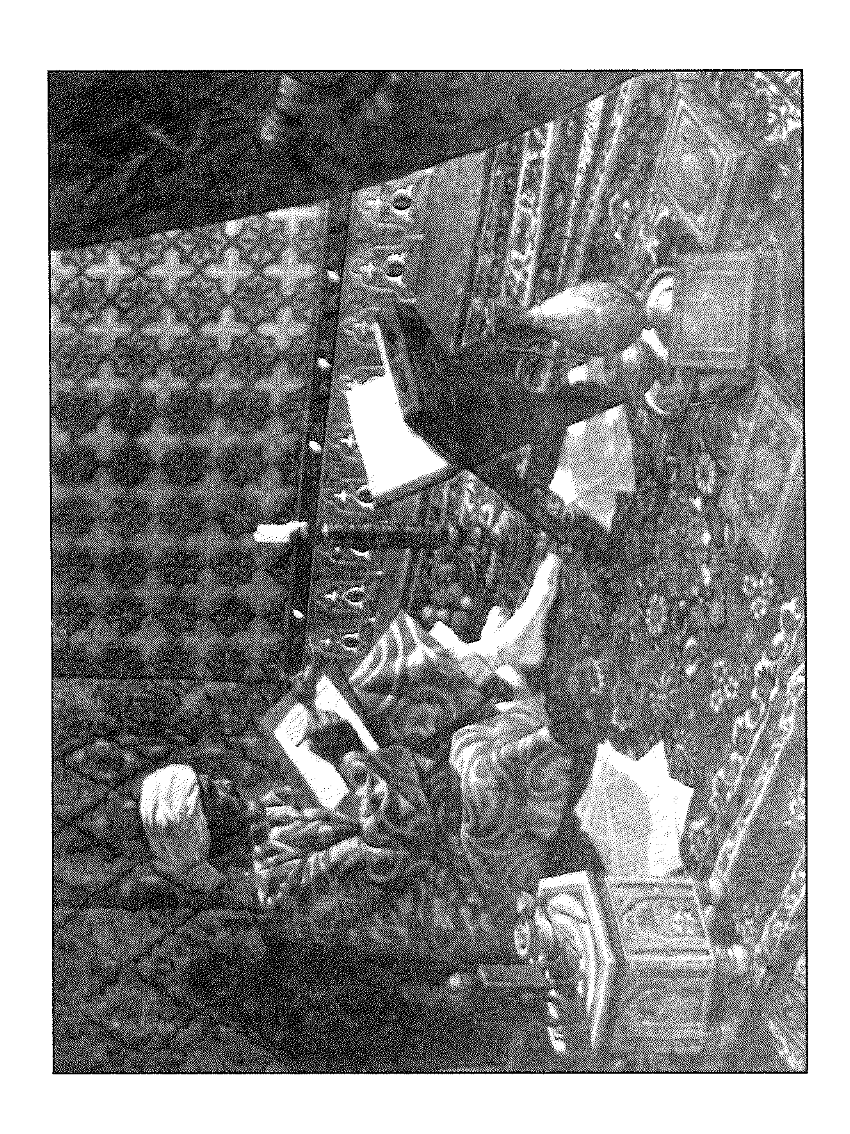
Among his other accomplishments was the accurate determination of the specific weight of 18 precious stones, the explanation of natural springs through the laws of hydraulics and the daring proposition that the valley of the Indus had at one time been the bed of a sea.

In summary, then, al-Biruni had the good fortune to be born into a culture able and anxious to encourage his scientific and

philosophical efforts. He had the equally good fortune to be born with a mind capable of making the very best use of what was available to him. His strength of character enabled him to overcome the vicissitudes of fate which might otherwise have forestalled him, and to find glorious opportunities in adversity. His natural inclination to take pleasure in acquiring knowledge, and to acquire that knowledge through tireless persistence and in an attitude of objectivity and detachment opened doors that were closed to many others.



Ibn Sina



Ibn Sina (Avicenna)

[980 - 1037 A.D.]
"The prince of physicians"
(Abu Ali Al-Husayn ibn Abd Allah ibn Al-Hassan ibn Ali ibn Sina)

"He is a scientific man, who attempts to bring the Greek theories to the level of that which needs to be expressed by the study of the concrete, when apprehended by a great mind." (Encyclopaedia of Islam, vol.III p. 914).

In 980 A.D., Afshanah was a village in the transoxian emirate of Bukhara, and it was there, in that year, that a son was born to one Abd Allah, one of the men entrusted by the amir of Bukhara, Nuh ibn al-Mansur, with the governing of the villages of this region. The boy's mother was called Sitara.

He proved to be an exceedingly intelligent boy; by the age of ten he had finished the Quran, many works of literature and the 'Indian Numbers' (arithmetic). There seemed to be nothing that did not interest him, and nothing as well which, ultimately, he was unable to master. He had become an adept at the interpretation of Islamic 'Sharia' before his father brought him a tutor, Abu Abd Allah an-Natali, to guide what he must have perceived to be an exceptional intellect. In fact, although an-Natali helped him considerably, in the end it was the boy who guided the tutor through the latter parts of 'Euclid'. Before he was sixteen he had studied in depth the natural sciences, metaphysics and (under Abu bin Mansur and Isa bin Yahya) medicine. In his own words, "Medicine is not one of the difficult sciences." He does admit, however, that a certain amount of effort had to be expended ("During the period of hard practice and study which then ensued, I never once slept the whole night

through."). After reading Aristotle's 'Metaphysics' a few times he knew the work by heart, although he owned he didn't understand it completely until he chanced upon a book on the subject written by Abu Nasr al-Farabi. He states that by the age of eighteen, his education had been completed.

He was Ibn Sina, the Shaykh ar-Ra'is; to those who considered him second only to Aristotle, he was 'the second teacher'. Others called al-Farabi the second teacher and Ibn Sina the 'third teacher'.

The West knows him as Avicenna, and he is most admired for his contribution to the field of medicine, both as a transmitter of the knowledge of men like Hippocrates, Aristotle and Galen and as an original thinker on the subject. However, his interest, his energy and his intelligence were all-embracing, and he also studied and wrote widely on philosophy, astronomy, mathematics, the Arabic language, music and several other domains of knowledge. In his study of Ibn Sina, Gohlman lists in his 'longer bibliography' of Ibn Sina's works 100 titles, and one need cite only a few to indicate the scope of his endeavours:

The Qanun (on medicine)
The Shifa (on philosophy)
Cardiac Drugs
The attainment of happiness
The refutation of astrology
Odes and Poems
The Arabic language
The colic
Introduction to the art of music
The management of troops
Arithmetic
Alive, the son of awake

Ibn Sina was as active physically as he was mentally. he was a man who sought successfully to meld the thoughtful and practical sides of his nature. Shaykh Ubayd al-Jusjani (his disciple, and

biographer) comments on his stamina, and mentions one occasion when the Shaykh ar-Ra'is rode out to battle alongside his patron, Ala' ad-Dawla, when the latter had decided to attack Hamadhan.

His administrative life must have begun just as he was finishing his education. When he was about seventeen and a half years of age, he was called to the court of Nuh ibn al-Mansur at Bukhara. His fame as a physician had even then become considerable, and he was asked to assist the doctors in treating this ruler. His success on this occasion led him into service at the court, and at the same time he gained access to Nuh ibn al-Mansur's fabulous library. He wrote, "I saw books whose names had not reached very many people, and which I had not seen before that time, nor have I seen them since. I read these books and mastered what was useful in them and discovered the status of each man in his science." In fact this library was subsequently lost in a fire which some of Ibn Sina's enemies attempted to ascribe to him.

He lived in a very unsettled time, and moved from one patron to another, sometimes because he chose to do so and at other times because it was forced upon him. On one occasion he was no sooner elevated to the post of vizier in the court of the Amir Shams ad-Dawla in Hamadhan than the amir's officers, who resented his high status and what they considered his haughty demeanor, turned upon him, and he was cast into prison for four months, during which time he was in peril of his life. It was his skill as a physician that ultimately restored his fortunes. After freeing and banishing him, the amir fell ill once again with the colic. Ibn Sina was called back, and was able to relieve Shams ad-Dawla, whose gratitude was such that he replaced him in the post of vizier.

Whilst he was involved in his demanding, hectic, administrative career, and in the midst of a general turmoil that stretched out over the years, he retained a cool detachment, a dedication and a determination that allowed him to write prodigiously - usually

without notes - on any kind of subject and also tutor and advise his followers. His ability to focus his intellect sharply and effectively, to the virtual exclusion of what would seem to most of us the irresistable problems pressing in on him, was legendary. Indeed, some of his writing was done as he travelled on horseback!

After Shams ad-Dawla had passed away and his place had been taken over by his son, Taj al-Mulk, Ibn Sina no longer felt comfortable or secure in Hamadhan. He and some of his followers secretly fled to Isfahan where they were welcomed by Ala' ad-Dawla, and it was in this city that he lived for the last fourteen years or so of his life. The amir profited greatly from the administrative skills that Ibn Sina was able to put to his service, and he must also have gained considerable prestige from having attached to him such an illustrious savant. Ibn Sina himself was able to finish many of the works he had started. However, his presence at the court of Ala' ad-Dawla started him on yet another career. He became incensed at some criticism levelled at him by another eminent member of the amir's court who questioned his expertise in the Arabic language, and this stimulated him to spend three years acquiring a pre-eminence in the field. This then equipped him to write his own scholarly work on the Arabic language.

Ibn Sina died in the year 1037 A.D., after having become ill whilst accompanying Ala' ad-Dawla on a military campaign in the region of Hamadhan. In order to speed up his recovery, he had purged himself eight times in one day, and thereby caused the ulceration of his intestine. Although he had periods when he seemed to be recovering, he also had frequent relapses, and towards the end, an error by an assistant doctor in formulating an enema and, possibly, the deliberate adulteration of a preparation of mithridate with opium (which he was using to combat seizures) further weakened him to the extent that he decided that his end was near and inescapable. He remained in a parlous state for a further few

days and "then he passed away into the presence of his Lord, and was buried in Hamadhan in the year 428" [i.e., 1037 A.D.] (from Abu Ubayd).

His great work on medicine is the 'Qanun'. It comprises five volumes, only the first of which is readily available in English translation. This volume alone runs to more than 150,000 words in the translation by Mazhar H. Shah. Certainly, the work is based on the knowledge of the Greeks which was available to the Islamic scholars of that time, but this is not the sole source. Some of the Ayurvedic writings from the Indian subcontinent were available in Arabic from the seventh century according to Gruner, and these are likely to have been seen by Ibn Sina. He also corresponded with Al-Biruni, who spent 10 years studying India. Shah also remarks on the similarity between Ibn Sina's discussion on the pulse and that of the Chinese system.

Hence, the source material used in writing the 'Qanun' was not exclusively 'Western'.

In 'General Prinicples', which is the first volume of the 'Qanun', Ibn Sina begins by defining medicine: "Medicine is the knowledge of the states of the human body in health and decline in health: its purpose is to preserve health and endeavour to restore it when it is lost." He bases the whole of the 'Qanun' on concepts which are difficult for our age to accommodate intellectually. The four elements which go into the constitution of all things are 'cold and dry' (earth), 'cold and moist' (water), 'hot and moist' (air) and 'hot and dry' (fire). According to the way the elements are mixed in a substance (or a human, who is a special type of substance) that substance will have a distinct pattern of activity and reactivity, and this is termed its 'temperament'.

Based on what the ancients had observed - that on accasion different types of fluid could be seen within the body or exuding from it - four primary body fluids were believed to exist. In the translation by O. Cameron Gruner, these humours are the

sanguineous, the serous, the bilious and the atrabilious. Mazhar H. Shah calls them blood, phlegm, bile and 'sauda' (a transliteration of the Arabic word for 'black'). Ibn Sina explains that "a body fluid or humour is that fluid moist body into which our aliment is transformed". He attributed elemental characteristics to each. Sanguineous humour is hot and moist; serous humour is cold and moist; bilious humour is hot and dry; atrabilious humour is cold and dry.

Everything, including the states of health and disease, have four causes, the material, the efficient, the formal and the final. Confusing, it certainly is, but before we reject what follows in the 'Qanun' because the bases are unacceptable (or unintelligible) we might perhaps ponder our own situation with respect to modern physics. Unless we are physicists engaged in fundamental research, our knowledge is based on an acceptance that everything derives from the simple, sub-elemental particles called protons, electrons and neutrons, which form atoms which in turn form molecules and so on. If the present trend in fundamental physics continues, it seems highly likely that radically different concepts which are presently being formulated will demand our shifting our own concept of reality in our turn to a new set of 'ground rules'. And yet, the Concorde is still flying, and it will continue to fly when we have accepted the new order of things. Ibn Sina's medical writings comprise a work on the theory and practice of medicine which 'worked' in his time and in fact 'worked' for Europe from the twelfth till at least the sixteenth century. Much, but not all of it, has now been abandonned, but that which has superseded it has come into existence partly because the 'Qanun' was written. Similarly, the fabulous machines in which we will fly in the 21st century will owe their existence in part to their precursor, the Concorde.

A large part of 'General Principles' is devoted to anatomy. Faculties and function are described, as are causes. The quality of

drinking water is discussed in some depth. A considerable portion of chapter 3 (on signs and symptoms) is devoted to the pulse, and this would still seem to used to great profit by the hakims. Chapter 3 also deals with urine. Of course there was no understanding of biochemistry at that time, and it is the appearance and consistency of urine and the different sediments formed in it that are mostly considered. A means of distinguishing true human urine from samples which are not genuine is described and it is not too surprising that the astute Prince of Physicians required a morning specimen. Although it was generally thought then that urine should not stand longer than six hours before being examined, Ibn Sina insisted that the sample be examined within one hour of collection!

Part Three dealt with the preservation of health, and Part Four with the treatment of disease. Purgation, emesis, venesection and cautery were methods of treatment dealt with at some length.

The remaining four volumes do not seem to be available in English. Volume 2 deals with pharmacology and therapeutics. In its second part, 760 drugs are noted and their properties and medicinal uses discussed. Volume 3 is concerned with 'simple diseases', Volume 4 with general diseases and Volume 5 is a formulary.

It has been mentioned already that Europe depended upon the 'Qanun'for the training of physicians for some four hundred years (in fact, the last edition published for purposes of study was actually brought out in 1658). The language used was Latin; editions appeared from Milan in 1473, Padua in 1476 and 1479 and Venice in 1482, 1486 and 1500.

There are those who opposed the influence of Ibn Sina: Arnald of Villanova (1235-1312 A.D.) and Ibn Zuhr of the Western Caliphate (1092-1162 A.D.) were among his fiercest critics. It is now agreed, however, that the Latin translations of the 'Qanun' were so replete with linguistic error as to preclude a true appraisal of his work by anyone using them as source material.

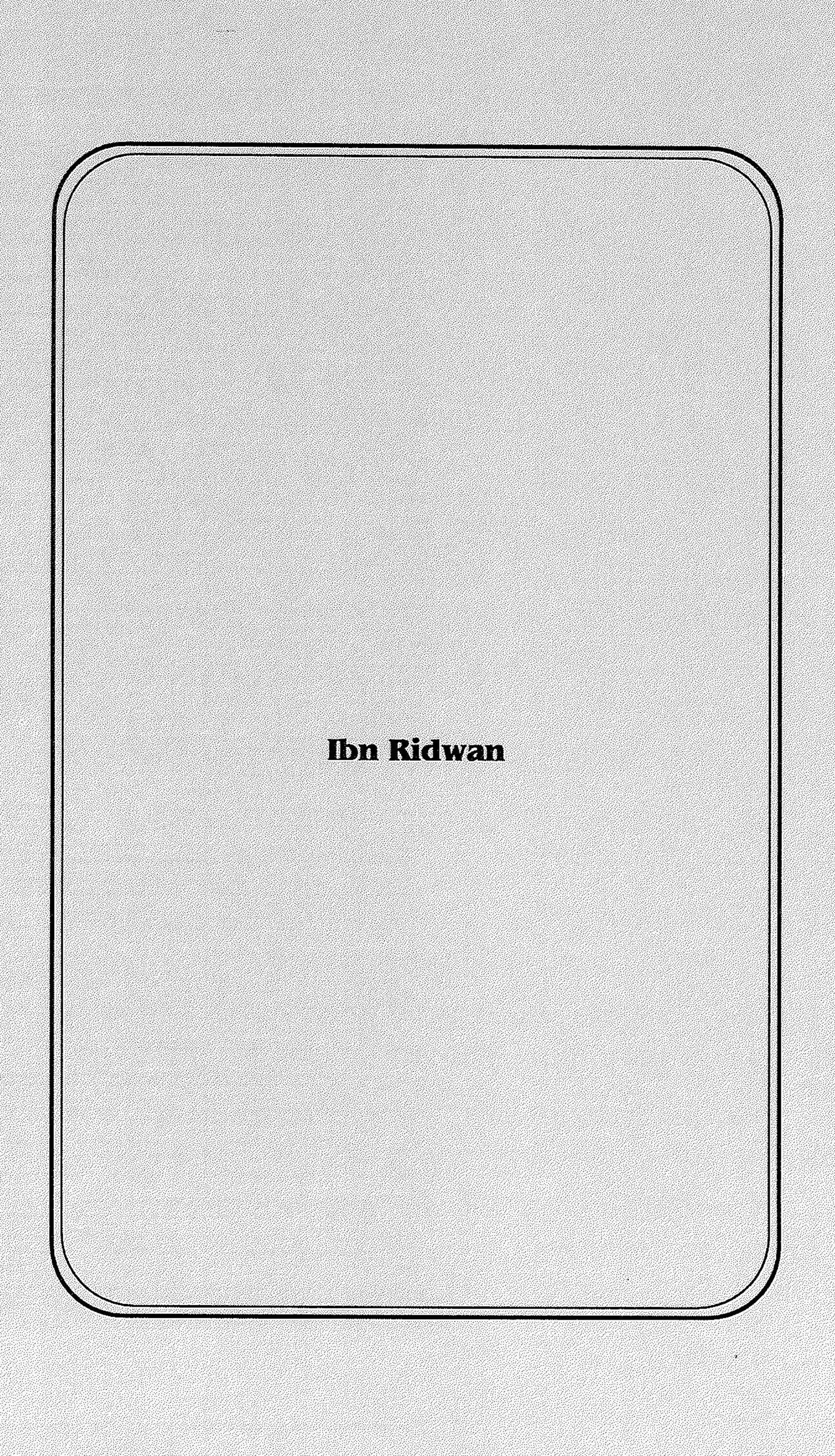
A shrine and study centre were built in Hamadhan in memory of this great man and, in 1954, a library and memorial tower were added.

Donald Campbell, in his 'Arabian Medicine and its influence on the Middle Ages' cites the work of others which suggests that the quatrains usually ascribed to Umar Khayyam may indeed be the work of Ibn Sina. Whether this be true or not, four such lines, in the English version of Edward Fitzgerald quoted by Mazhar H. Shah would seem to be a fitting epitaph:

Up from the earth's centre through the seventh gate
I rose, and on the throne of Saturn sate,
And many a knot unravel'd by the road;
But not the master knot of human fate.

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Ibn Ridwan

IBN RIDWAN

(Haly ibn Rodwan, Rodohan Aegyptius)

(Abu al-Hassan Ali ibn Ridwan ibn Ali ibn J'afar al-Misri)

"Because every man must have a calling, and as medicine is a pious profession, I embraced it. Besides, the signs under which I was born so ordained. But I was poor, and I encountered many difficulties. My living I earned through astrology, teaching and the practice of medicine. I continued my assiduous studies until the age of thirty-two at which time I found myself in easy circumstances. As medicine was bringing me in more than was necessary, I was in surplus. From this moment, I regulated my expenditure in such a way that, after what was necessary for my well-being, I could make charitable donations and save towards any bad times. After the day's work, I examined the work I had done. If it was good, I rejoiced in it, if bad, I castigated myself and resolved never to fall back again." [translated from Lucien Leclerc's French rendition of the writings of Ali Ibn Ridwan]

Ibn Ridwan's life was lived in an Egypt which was under the rule of the Fatimids who held the country for a period of some two centuries until they were finally displaced by Shirkuh and his nephew, the great Salah-ad-Din. The story of their rise to this position of control is an interesting one which has been described by M. Canard [Encyclopaedia of Islam] .They were adherents of Isma'ilism, a type of Shi'ism which was based on the belief that a Mahdi would appear who was descended from the Prophet Mohammed through Ali and Fatima in the line of Ismail, son of Jafaar as-Sadik. The Mahdi was a man who was to be given a very special religious role by God. They initially established themselves

in North Africa in 910 A.D. under Ubayd Allah Said, the first Fatimid caliph [909 - 934 A.D.], who took upon himself the title of Mahdi and Amir al-Mu'mineen (Commander of the Faithful). In fact, much of North Africa had till then been controlled by the Aghlabids whose rule dated from the time of Harun al-Rasheed (786-809 A.D.). This dynasty had established their own "House of Wisdom" [similar to that in Baghdad] as well as a School of Medicine in Kairouan (now in present day Tunisia) (Sleim Ammar). It was itself a flourishing centre of culture and science, and the Fatimids inherited this. However, their ultimate goal was to replace the rulers of the Western and Eastern Caliphates as well as Christian Byzantium. Using this as a base, therefore, they directed their efforts initially towards Egypt, and Ubayd Allah and the following caliphs al-Kaim [934 - 946 A.D.] and al-Mansur [946 - 953 A.D.] attempted without success to conquer the country. This was finally accomplished by Djawar, a general of the next caliph, al-Mu'izz [953 - 975 A.D.], who took advantage of a famine and internal discord to take al-Fustat in 969 A.D. The general's first acts were to take measures to mitigate the effect of the famine and to found a new town, Cairo, close to the existing city of Al-Fustat [Schacht, Encyclopaedia of Islam, suggests that there was already some small settlement on the site]. Indeed, the first stone of the renowned al-Azhar mosque was laid in this new town in April of 970 A.D. (Al-Azhar was completed in only two years). As Sleim Ammar notes, it became, and remains to the present day one of the most illustrious places of learning in the Islamic world. Fatimid control extended itself to Makka and Medina by 971 A.D. It was apparently already established in the Yemen. In 973 A.D., when Djawar had established himself securely, al-Mu'izz entered the new town, and Fatimid rule of Egypt began.

At its zenith, Fatimid rule stretched from the Atlantic to the Red Sea. Industry and economic activity flourished. In Egypt, the

pre-existing administration guaranteed revenues from taxes and dues as well as from trade, which derived from India, Italy, Abyssinia, Nubia and Byzantium. North Africa, Spain and Europe in general also had trading relationships with Egypt.

The active support of cultural activities was characteristic of Islam generally, and the Fatimid dynasty was no exception to this rule. Building on its legacy from the Aghlabids, culture (including religious studies, poetry, literature, science, history geography and medicine) was further fostered and encouraged.

Unhappily, internal dissension among the Fatimids complicated their rule, and their tendency to appoint children to the position of Caliph (necessitated by their adherence to the principle of inherited succession) made easier the rise of various contending factions. This was exacerbated by the waxing power of the viziers, who in theory acted as the agents of the caliphs but who in the end became "Viziers of the Sword" and in effect took control away from them. Their situation was made even more difficult by the entry of Europe into the Middle East with the advent of the Crusades. In fact all of this allowed the general Shirkuh to move into Egypt and paved the way for Shirkuh's nephew, Salah-ad-Din to ring down the curtain on Fatimid rule in 1171 A.D..

As Canard has written, "The Fatimid period had periods of greatness, thanks to its administrative and financial organisation, its economic development, the flourishing intellectual and artistic activity, the pomp of court and palace which was, as William of Tyre testifies, maintained up to the end, the ceremonial and ostentatious feasts, which immediately provoke comparison with Constantinople and far surpass what had previously been known at Baghdad. But it suffered also periods of misery and famine, bloody struggles between military factions, and a disastrous end among the intrigues of rival viziers appealing for the intervention of foreign powers."

According to most sources, Ali al-Hassan Ali ibn Ridwan ibn Ali ibn Jafaar al-Misri was born in 998 in Giza (Leclerc suggests the date was 'about 980'), close to Cairo. Ibn Abi Usaybi'a has related his biography in considerable detail. His father, who was a baker, died while ibn Ridwan was still very young. He showed a definite proclivity towards study even when as young as six years of age, and Ibn Abi Usaybi'a quotes ibn Ridwan as stating this himself. However his early life was a hard one; he was forced to support his family through hard labour while at the same time carrying on his studies. When he went to Cairo ["the Great City" as quoted by Usaybi'a] at the age of ten he had already undertaken a considerable amount of personal self tuition; his study of medicine and philosphy began when he was fifteen. Unlike most of the other eminent men who took up medicine, he was unable to afford the costs of an apprenticeship, and he learned through studying the writings of those who had preceded him - most particularly the ancient Greek men of learning, such as Hippocrates, Galen, Plato, Aristotle, Dioscorides, Oribasius and Paul of Aegina, but also men like Hunayn ibn Ishaq and ar-Razi. He reasoned that in his library 5 books would suffice for literature, 10 for the Islamic Sharia and 4 for agriculture and pharmacy. However his medical library needed a very extensive number of books written by the authors named above. Being the self-taught man that he was, he leaned heavily towards this approach to learning, and he tended to disparage the other road to knowledge, learning from personal contact with contemporary savants.

He was a religious man who set aside time for the worship of God through contemplation of His creation and universe, and his resolve to behave in a righteous manner was firm, although he may be criticised for departing from this somewhat when disputing with his peers.

In attacking any problem he would first hypothesise on it and then analyse it in order to decide whether the hypothesis met the necessary conditions. If it did, he went ahead, if it did not he rejected it. He claimed to meet any catastrophe first and foremost by turning to God; he would then think his way clearly through all its aspects and, having done that, meet it without cowardice or rashness.

He recognised the need for physical exercise to maintain the body in health, and he undertook to perform sufficient sporting activity to ensure this. He would always rest a while after such sports before taking food.

His basic attitude to life in general was a simple one. One should attempt always to be modest, to help those in need and hasten to the rescue of those who solicited such help. He most valued the rich feelings he obtained as a result of the deeds he performed. He spent his money on maintaining his household at a level which was neither extravagant nor miserly. In fact he attempted to keep to the middle road in all things, and to dispense charity to his kin and his neighbours.

He became "Chief of Physicians of Egypt", probably under the caliph al-Mustansir [1036 - 1094 A.D.], and he also became the caliph's personal physician (Ullmann). Leclerc reminds us of the great powers which Sinan ibn Thabit (died 946 A.D.) held when he had such a position in Baghdad, noting that although the extent of ibn Ridwan's powers in this position are not known, his character and high principles must have had a very salutary effect on the physicians of his time.

Ibn Ridwan was a fervent admirer of the ancients; Ibn Abi Usaybi'a has quoted him on the seven principles (derived from Hippocrates) by which a physician should govern himself (translation courtesy of Mr. Ahmed Juma'a):

1. *He should endeavour to be perfect in his manners, and should have a*

healthy constitution. He must be intelligent and wise, show insight and be good natured. He must make frequent reference to God.

2. *He must be well dressed, well scented and clean in both body and dress.*
3. *He must be one who can be trusted with the secrets of his patients, never revealing their weaknesses or illnesses.*
4. *His desire to heal and cure the patients must be greater than his desire to earn money. His desire to cure the poor should be stronger than his desire to cure the rich.*
5. *He must be careful, keen on learning and excessive in his ardour to help and benefit people.*
6. *His heart [i.e., character] must be sound; he must be honest and truthful. When he enters the houses of the rich there should enter his mind nothing petty such as women and money; he must forebear against touching such things.*
7. *He must be trustworthy, as he is trusted with souls and money. He must prescribe no poison nor any substance of which he is ignorant, nor any abortive agent. He must cure his enemies with the same good intentions he applies to his friends.*

Again, Ibn Abi Usaybi'a details ibn Ridwan's approach to the examination of a patient [translation by Mr Ahmed Juma'a]. Ibn Ridwan noted that a sound body is one which is void of all defects, with each organ preserving its basic temperament. Such weaknesses as may exist are detected by examining the organs' appearance and temperament, using touch and sight. One can examine internal organs by examining the outer ones in various ways. For instance, one can call the patient from a distance to test his hearing powers and one can test his sight by determining how he sees near and distant objects. The tongue [i.e., speech] can be tested by assessing the quality of the words he produces. His overall strength can be assessed by having him carry heavy loads, having him grasp or

noting his control and making him walk forwards and backwards. His intestines can be examined by having him lay on his back with arms and legs fully stretched out. The temperament of his heart may assessed through the pulse, the state of his liver through his urine and by noting the different mixture of the [four] humours. His mental powers generally may be checked by putting questions to him; obedience and understanding can be checked by giving him orders.

Ibn Ridwan is credited with more than 100 written works of which, according to Schacht, some twenty still exist. He wrote mostly on medicine, but he also composed works on astronomy, logic, philosophy, physics, astrology and theology, as well as an autobiography.

Such wealth as he did acquire did not change his attitudes; he always remained devoted to study and to teaching, and he continued to lead a sober life. It is said that much of his money went on maintaining his home.

He would seem to have been rather impatient with those who disagreed with him, and his acerbity later earned him the title. "Crocodile of the Devil" from Ibn Butlan, with whom he carried on a lengthy intellectual dispute. Usaybi'a notes that he had an argumentative nature, and that he tended to conduct his side of any argument in a rather silly way, attempting to degrade his opponent.

Al-Kifti was particularly critical of him. Schacht quotes the former as follows: "He was a man of narrow mind and not of sound judgement. He was, moreover, not of good looks or appearance. Nevertheless, many pupils followed his lectures and studied under him, and his fame spread abroad."

Julien Leclerc saw him in a different light. While he was of the opinion that he was not of the first rank among the eminent figures in medicine, he observed that if ibn Ridwan had not risen quite so high, he had started from much further down than had others. In

fact, he considered him one of the most worthy characters of medicine from the Arab world. Most opinion would appear to depict him as a man with a surprisingly deep knowledge of the works of the ancients and it would judge his works as indicating a very faithful adherence to their views. His works are not considered original for the most part. Some of his writings were translated into Hebrew and Latin, and they were known to Europe, where he was known as Haly ibn Rodwan or Rodohan Aegyptius. This would certainly indicate that he had some influence on the development of medicine in Europe.

Indeed, his attitude towards the writings of others was coloured greatly by whether he deemed them to have been true to the ancient opinions. He criticised Hunayn ibn Ishaq, Ali Abu al-Farag Abdulla ibn at-Tayyib and Abu Bakr Mohammed ibn Zakarriya ar-Razi for their having disagreed with them. One of his major criticisms of another famous physician, Ibn Butlan, was that he had accepted what the Alexandrians had written on the ancients without confirmation through actually consulting the original texts. He felt the Alexandrian commentaries to be incomplete and not all-inclusive. However, he was so knowledgeable about the ancients that he was not averse to judging them himself. What he did not agree to, he would mark, "of no use".

His discussions - one might almost say his war of words - with ibn Butlan have endowed him with a certain notoriety. Grand'Henry notes that Abu al-Hassan al-Mukhtar ibn Abdun ibn Sudun ibn Butlan was a Christian and a pupil of the Nestorian (Christian) priest, physician and philosopher, Ali Abu al-Farag Abdulla ibn at-Tayyib. Ibn Butlan was an inhabitant of the city of Baghdad, and he began his criticism of ibn Ridwan obliquely by directing his arguments at the latter's pupils. Then, in 1048 A.D., he decided to set off on a tour during which he was to visit Aleppo, Antioch, Laodicea, Jaffa, Cairo and Byzantium. After first being

arrested for a period of time in Syria, he went on to Egypt via Palestine and stayed in al-Fustat during the years 1050 to 1053. It was then that the two men faced one another. Ibn Butlan was to end his years in a monastery in Antioch where he died in 1068.

The duel of words between the two took place for the most part through their production of books, each being an answer to the claims in the rival's last book. It was ibn Ridwan's opinion that ibn Butlan was simply a medical practitioner without the necessary erudition which marked the man who was also a philosopher, theologian and logician. Their polemics really seemed directed at proving "which of the two doctors appeared to be the truer representative of the knowledge of the ancients" (Ullmann). Ibn Butlan strongly defended the right to openly criticise the ancients whereas ibn Ridwan held so strongly to the opposite view that he publically discredited those commentators who had not been unswervingly faithful to them. Ibn Butlan also defended Hunayn ibn Ishaq against ibn Ridwan's assertion that he (Hunayn) had badly misinterpreted the thoughts of Galen.

Ibn Butlan actually went so far in his attacks on ibn Ridwan as to accuse him of fatal errors in his treatment of deceased patients who, he claimed, would demand justice at the Last Judgement.

Ibn Ridwan was a fervent advocate of personal study and reading of ancient texts which he considered much much better than being taught by others. In opposition, ibn Butlan insisted that oral instruction was very useful.

They discussed questions of the comparative climatology of Cairo and Baghdad, with ibn Butlan contrasting what he considered the healthy climate of Baghdad with what he considered the equally unhealthy climate of Cairo.

Both polemicists seemed to become carried away with themselves to the extent that ibn Ridwan's arguments contained much bitterness and contempt. Ibn Butlan on the other hand resorted to

describing his adversary as physically unattractive (which apparently he was). He wrote a particularly offensive poem in this vein which he directed at his unfortunate rival. He termed him the "Crocodile of the Devil".

That ibn Ridwan was a rather bitter man may have had something to do with the very hard life he led. There was much personal tragedy in it. The travails of his early life have been mentioned already. During his maturity, he suffered the catastrophe of losing his son and then two young daughters. This must have left a very great emptiness in him. In a period of famine and plague which began in 1053, he adopted a little girl and raised her as his own; in the end, she was to betray him outrageously in a very heartless manner by robbing him of a chest of precious objects and 20,000 dinars in gold - everything in fact that he had managed to set aside. She disappeared and was never seen again. Usaybi'a states that Abu Abdulla Mohammed al-Maleki al-Nasikh described ibn Ridwan as having undergone a change in his ability to think towards the end of his life. No longer in possession of his full faculties, he died sometime later, possibly in 1061 [al-Kifti is said to have set the date at about 1067; Ullmann mentions 1068].

Ibn Abi Usaybi'a's listing of the written works of ibn Ridwan occupies more than two pages. As listed in Leclerc, they include (to cite only a few)

Elements of Medicine
Memorial of medicine
How to study medicine
Purgatives
Preparing drinks, electuaries
Fevers (varieties, periods)
Chronicity in disease
Pandects of Medicine
Notes on medicine
Treatise on barley
Food and medicines
Dyspepsia
Tumours
Elephantiasis in infants

Reply to questions on the pulse

Origins of science

Role of logic in science

Excellence of philosophy

Commentaries on Hippocrates

Commentaries on Galen

An autobiography

Astrology

One of his writings which was circulated in Europe was his "Commentaries on the Quadripartitum of Ptolemy" (Sharh al-makalat al-arba li-Batlumiyus). This was translated into Turkish and into Latin (in 1413, 1484 and 1493 A.D., according to Grand'Henry), and it was one of the reasons he was well known in Europe.

His commentaries on Galen which he finished in 1041 A.D. (Grand'Henry) were translated first into Hebrew by Samuel ben Tibbon in 1199 and later into Latin by Gerard of Cremona, the latter being published in Venice in 1496.

He wrote another work, Kitab an-Nafi fi Kaifiyat ta'lim sina'at at-Tibb ("The useful book on the art of medical instruction") in which he detailed the Summaria Alexandrinorum of the writings of Galen and Hippocrates in 8 chapters. The book also contained an autobiographical report as well as a 3 chapter polemic against Hunayn ibn Ishaq and Abu Bakr ar-Razi whom he considered had misunderstood the ancients (Ullmann).

His Kitab Daf' madarr al-Abdan bi Ard Misr ("The prevention of physical harm in Egypt") contains, according to Ullmann, 15 chapters on climate and ilnesses, particularly the plague and the postulated causative factors. The sixth chapter is on the topography of Cairo. The fourteenth describes remedies for the plague as given by as-Sahir, ar-Razi, ibn Masawaih and ibn al-Jazzar.

Also noted by Ullmann is ibn Ridwan's Kitab Hall Shukuk ar-Razi ala Kutub Galinus ("Book of the solution of ar-Razi's doubts on Galen's Books").

Jacques Grand'Henry has recently produced a translation into French of the Kitab Kiffayat at-Tabib which he translates as the "Book on the method of medicine". The full title of the work is Kitab Kifayyat at-Tabib fima Sahha ladaiya min at-Tijarib ("Book of what is sufficient for a doctor from what I have found correct from experiments"). His translation of the section on therapeutics is available here in Kuwait. In common with all physicians of the Islamic era, Ibn Ridwan bases his therapy on the theory of the four humours, the sanguinous, , the bilious, the atrabilious and the serous (blood, bile, black bile and phlegm), on the detection of corruption or imbalance in the humours in a given organ and in either removing the corrupted humours or adding what is necessary to re-establish the proper proportions. In his words, "The method of treatment in each of our organs is the evacuation of corrupt humours and the renewal of the necessary mixture of the humours." Bleeding and the administration of purgatives were two common approaches which he discusses. Others also discussed are medicines in the form of pills, electuaries, conserves, jams, pastilles, powders and dry medicines, poultices, compresses, mouth washes, oils, sedatives, enemas, eye washes, medicines which are snuffed or inhaled and 'acidic elements'.

He describes four types of remedy:

(1) *A poison: A substance which acts on the body when it reaches it without the body acting on it in turn.*

(2) *A food: A substance that is affected by the body when it reaches it.*

(3) *A food serving as a remedy: A substance which first acts on the body when it reaches it and is then affected by the body, which alters it.*

(4) *A remedy: A substance which on reaching the body heats, cools, moistens or dries it.*

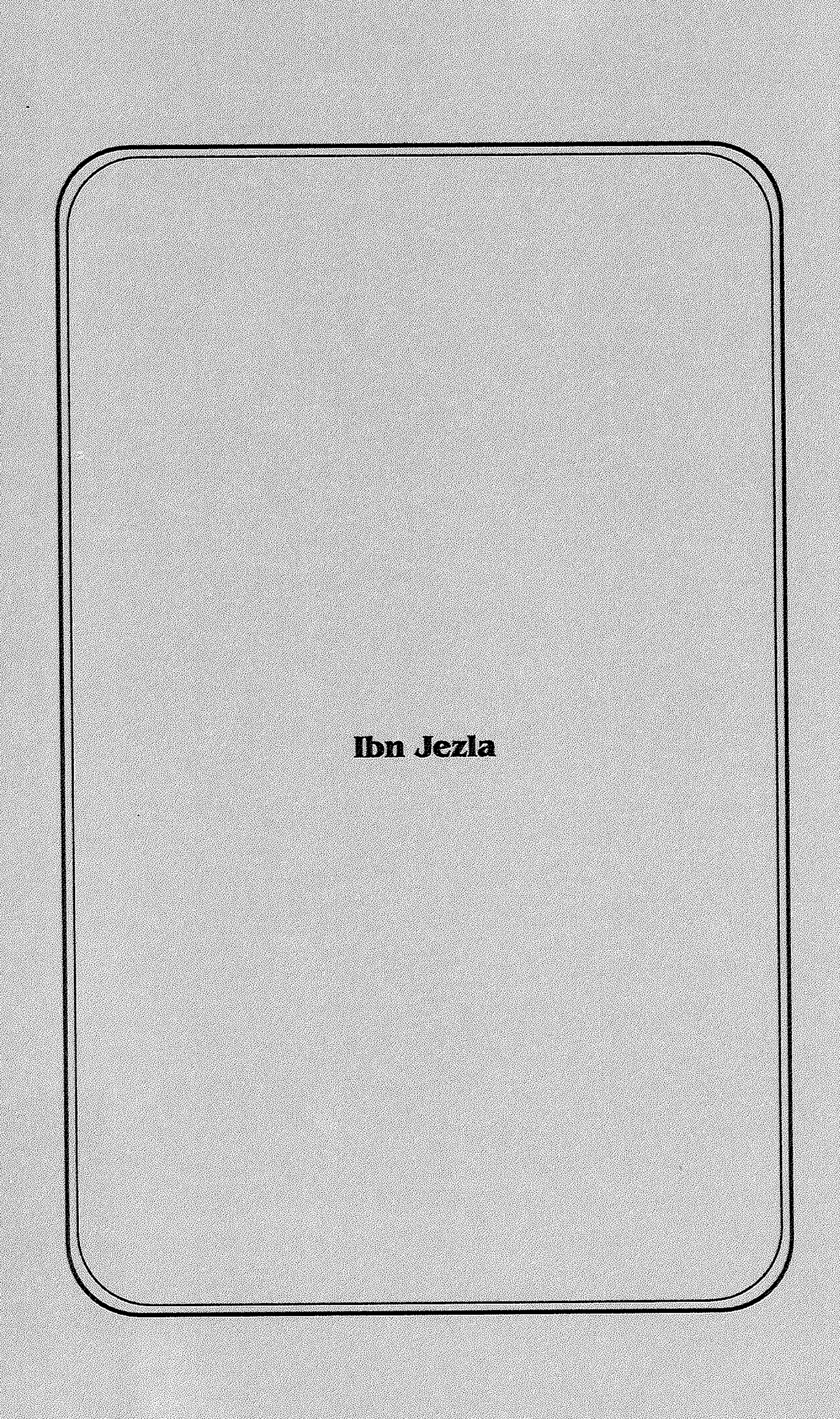
Ibn Ridwan also describes the four degrees of effect of a substance. Where its action is hidden, its effect is of the first degree. It is of the second degree when its action is slightly more evident, in

the third degree when it is clear and evident and of the fourth degree when important and strong.

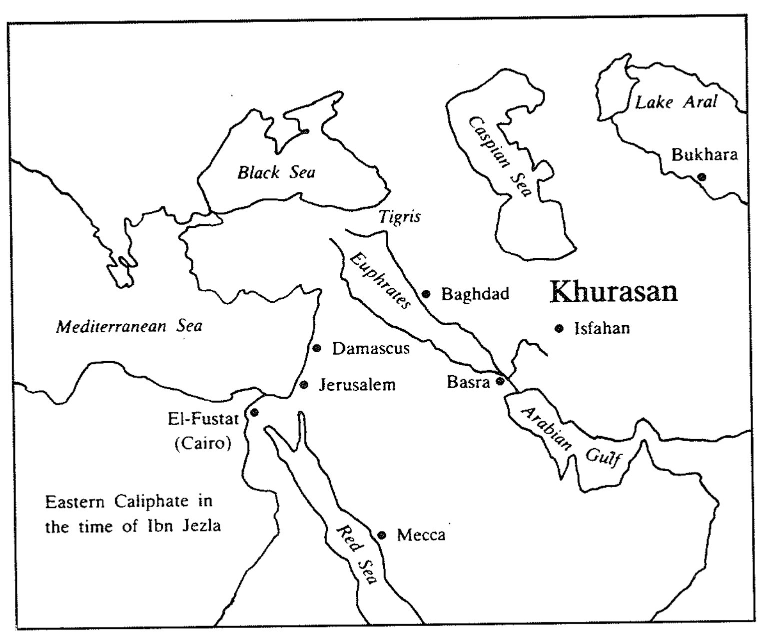
To sum up, Ibn Ridwan was a man of some genius who literally educated himself, fighting against poverty and caring for his family while he did it. He was the target of many of the "slings and arrows of outrageous fortune" despite which he prevailed and made a significant contribution both to medicine in his own time and that in Europe later. If his cantankerous nature must be considered an annoying fault, his adherence to his principles and his generosity, for which he paid dearly, must surely tip the balance in his favour. He has earned the respect and admiration of later generations.

Acknowledgement

I am very grateful to Mr. Ahmed Juma'a, Dept. of English Language, University of Kuwait, for his advice generally and for his translation of Ibn Abi Usaybi'a's biography of Ali ibn Ridwan in particular, and to Dr. Phil Reavey for having checked the manuscript.



Ibn Jezla



Adapted from: Muir's Historical Atlas-Ancient, mediaeval and modern, Treharne and Fullard, eds. Book Club Associates, London 1973

Ibn Jezla (Ben Gesla, Byngezla, Buhahylyha)

[1035(?) - 1100 A.D.]
(Yahya bin Essa bin Ali bin Jezla al-Katib al-Baghdadi)

"He was Yahya bin Essa bin Ali bin Jezla, and he lived in the time of Al-Muktadi bi-Amr Allah. He brought out in his name many books which he composed, and he was one of those renowned in the science and practice of medicine. He was a pupil of Abi Al-Hassan Saieed bin Hibat-Allah. Ibn Jezla was also active in the discipline of literature. A very beautiful calligraphy was ascribed to him; I saw many books composed by him in his own hand, and other things give testament to his kindness and indicate his knowledge. He was [initially] a Nazarene, but he embraced Islam, and [thereafter] was the author of a letter answering the Nazarenes which he addressed to the priest Ilya." (translation from Ibn Abi Usaybia's 'Uyun al anba fi tabaqat al atibba)

Lucien Leclerc has shown in his comprehensive and illuminating "Histoire de la Medecine Arabe" how the Zeitgeist of the early period of expansion of the empire of Islam engendered a passion for knowledge which, once enflamed by those remarkable rulers, the Abbasid caliphs, initiated a quest for Greek, Indian and other manuscripts and their speedy translation into Arabic. This first step in the acquisition of science in its broadest sense was most actively pursued in the ninth century, and almost all of the principal translators were Christians, Sabians or Jews. There were very few Muslim Arab scholars represented, although Al-Kindi was an outstanding exception to this rule. The great ar-Razi, who lived in the ninth and tenth centuries, was a Persian Muslim.

Consolidation took place in the tenth century. It can perhaps be considered the period during which the harvesting of the knowledge of the Greeks, the Indians and others was more or less completed

and the balance of intellectual activity which had heretofore been predominantly Christian, Sabian or Jewish in character began to shift in favour of Muslim savants. This is an understandable development since most of the knowledge of the ancients was now available in Arabic, and Islamic culture actively enjoined the adherents of Islam to acquire knowledge and to make use of it.

In the eleventh century, this shift intensified. Lucien Leclerc lists some 20 Christian, 4 Sabian and 4 Jewish medical savants for the tenth century. For the eleventh, he lists only 3 Christians and 6 Jews, and more than 50 Muslims, including Ibn Sina. Ibn Jezla grew up in a time when the majority of the outstanding thinkers were Muslims, He lived in the eleventh century and was reared as a Christian, but he embraced Islam and died a devout Muslim.

The eleventh century saw a continuation of the fragmentation of the Islamic Empire, and the Caliphs in Baghdad were subject to foreign overlords. The Seljuk chief, Tughril Beg took over Khurasan, a vast territory to the east of Baghdad, in 1040 A.D. Leclerc notes that his son, Alp Arslan entered Baghdad in the year 1055 A.D. His appointment of Nizam al-Mulk as his minister placed a man in power who, according to Leclerc, was not only a protector of intellectuals but also an outstanding thinker himself, and the founder of the Madrassat an-Nisamia and some hospitals. The Caliphs with whom Ibn Jezla must have had to deal were much diminished in power by the Seljuk presence, but they must still have been able to influence the intellectual climate during their reigns. Abdulla (al-Ka'im) was caliph from 1031 to 1075, and al-Muktadi held this position from 1075 to 1094. His son, Ahmad (al-Mustazhir) ruled from 1094 to 1118. In 1097 A.D., Christian crusaders crossed the Bosphorus to begin the first Crusade, and the end of the eleventh century saw the fall of Jerusalem to the Frankish Crusaders.

Ibn Jezla was born in Baghdad. Graziani suggests that the year of his birth probably lies between 1030 and 1040 A.D., based on the observation that he already had a knowledge of diction between the years 1060 and 1070, and that such knowledge was usually attained between the ages of 20 to 30. He was therefore born at about the time of Ibn Sina's death. He began his study of medicine under Christian tutelage when he was still a Christian himself. One of his teachers was Saieed bin Hibat-Allah. His interests expanded to include philosophy, and he studied under Abu Ali bin al-Walid. It is said that it was the convincing arguments of the latter in favour of Islam which finally persuaded Ibn Jezla to renounce the faith into which he was born and to embrace Islam. The date of this conversion was 1074 A.D.

Following this, Ibn Jezla wrote to a Christian priest, Ilya, pointing out what he considered to be the errors into which the Christians and Jews had fallen and extolling his new faith, that of Islam. His criticism of his former faith and that of Judaism was severe. Lucien Leclerc notes that there is a biographical sketch of Ibn Jezla appended to a copy of his work, 'Minhaj Al-Bayan' which is to be found in Paris (No. 1021, anciens fonds) in which the writer states that Ibn Jezla's conversion was genuine. He adds that Ibn Jezla claimed that the Christians and Jews had altered the scriptures where the coming of the Prophet had been announced. Vernet states, "it is apparent from the author's [Ibn Jezla's] attitude that the basic reason for his conversion to Islam was his identification of Muhammed with the prophet announced in the books of the Pentateuch and the Gospels". Herman Baas (who does not seem to be overly sympathetic to the culture of the Arabs) has termed his behaviour as being that of a "true renegade".

After this conversion, Abu Abdullah ad-Damigani, chief of the Cadis in Baghdad (i.e., Chief Justice) and possibly chancellor of the Caliph, was impressed by Ibn Jezla and appointed him as his

physician and later his secretary. Ibn Jezla worked in the Adudi Hospital and tended patients there, where Saieed bin Hibat-Allah also practised, and he also took on patients in al-Karkh, the quarter of Baghdad in which he had his home. Campbell observes that a claim that he also served as physician to Charlemagne is untrue (Charlemagne, King of the Franks and, latterly, Emperor of the Christian West, lived from 742 to 814 A.D.). Leclerc suggests that this claim was made because a Latin translation of one of Ibn Jezla's books, 'Taqwim al-Abdan fi Tadbir al-Insan' was dedicated to the most Christian King, Charles of Naples, who was confused with Charles the Great (Charlemagne). His fame as a practitioner of medicine was accompanied by a similar fame in its theory, and he wrote several books, and further developed a tabular or synoptic style of presenting data which, Graziani notes, was first used by Ibn Butlan to display astronomical information. The beauty of his penmanship in the 'Naskh' style is much admired by Graziani.

He was a man of some means. After his administrative appointment, he continued to see and treat patients, but he refused to accept payment for this and in fact even provided them with free medication. Graziani notes that from Ibn Jezla's written works, it is known that he was involved while working at the Adudi Hospital in the study of renal problems and that he did some research into "toxicology, hereditary and non-hereditary diseases, as well as on fertility and sterility in both men and women". He comments further on Ibn Jezla's cautious approach to the practice of medicine. Like ar-Razi, he believed in using the simplest means of affecting a cure using first "exercise, baths and physical treatments, then ... diet". Simple drugs were then used, with complex, more dangerous drugs left as a last resort.

As with many of the eminent people in the Empire of Islam, he lived and worked in unsettled times. In fact he probably died in 1100 A.D., the year of the fall of Jerusalem to the Franks, whose

seizure of the holy city was accompanied by much blood letting. Lucien Leclerc and Cyril Elgood both state that another date is given for his death by the 'Kitab al-Hukama' - 1080 A.D. Leclerc points out that, as much of Ibn Jezla's work is dedicated to al-Muktadi who began his rule in 1075, this date is an unlikely one. Ibn Jezla bequeathed his books to the mosque of Abu Hanifa.

Ibn Abi Usaybi'a notes that Ibn Jezla dedicated two of his books to al-Muktadi, 'Taqwim al-Abdan' and 'Minhaj al-Bayan fi ma yast'amiluhu al-Insan' He also mentions 'Kitab al-Ishara fi talkhis al-Ibara'.

The 'Minhaj al-Bayan fi ma yast'amiluhu al-Insan' ('Methodological exposition of that which is used by man') is, according to Leclerc, a treatise in alphabetic form of simple and compound medicaments and foods. He notes that the Bibliothque de Paris contains a copy of the manuscript which has 360 pages in folio form, and that Ibn Jezla drew upon Hippocrates, Dioscorides, Rufus, Oribasius,, Paul of Aegina, Ishaq, ar-Razi and al-Majusi and others unnamed in his writing of it. When it appeared -Leclerc continues - there was no work on materia medica that could compare with it excepting for the second book of the Canon of Ibn Sina. It remained sufficiently important for Ibn Baytar (1178 - 1248 A.D.) to write a critical commentary on it about a century and a half later. This work was dedicated to the caliph al-Muktadi. J. Vernet (Encyclopaedia of Islam) mentions the existence of a modern French translation of the Minhaj by P. de Koning.

Ibn Jezla's more important work as judged by the extent to which it affected the West as well as by its content is 'Takwim al-Abdan fi tadbir al-insan' or 'Tacuini oegritudinum et morborum fere omnium corporis humani cumeuris eorundum Buhu Hylyha Byngezla autore' as it is called in its Latin form. This book is described in depth by Graziani in his 'Arabic medicine in the eleventh century as presented in the works of Ibn Jazlah'. He has translated the Latin title as,

'Tacuini of maladies and diseases of almost all the human body, the author Buhu Hylyha Byngezla' The Latin translation was done by Farragut the Jew; it was published in Strassburg in 1532. In 1533 a German translation was published by Han Schotte.

The work is drawn up in synoptic form, there being 44 tables with information on 352 maladies, together with the diets which are appropriate to them [Vernet]. Such a tabular array must have been useful to the busy physician who could not leave his patient waiting while he pored over Ibn Sina's million word 'Qanun' or (in the unlikely event of his having access to it) ar-Razi's huge 'Continent'. In fact, Graziani states that Ibn Jezla was even more ambitious. "His intention was for the reader to dispense with the need for physicians and their lengthy medical books, containing their knowledge of diseases, their prognosis, etiology and symptoms, all of which were included in his book." A copy of the book is to be found in Paris, combined with Ibn Butlan's 'Taqwim as-Saha' listed as No. 1024, anciens fonds. Strangely, although he credits as his sources the ancient Greeks and men from the Islamic period such as Hunayn Ibn Ishaq, ar-Razi and al-Majusi, Ibn Jezla does not mention Ibn Sina, according to Graziani.

Graziani lists the twelve sections used by Ibn Jezla to deal with each disease as follows:

1. Name of disease

2. Temperament

3. Age

4. Season

5. Country favorable to its genesis

6. Prognosis (safe or grave)

7. Aetiology

8. Symptoms

9. Phlebotomy, vomiting, enema

10. Royal Treatment

11. Simple Treatment

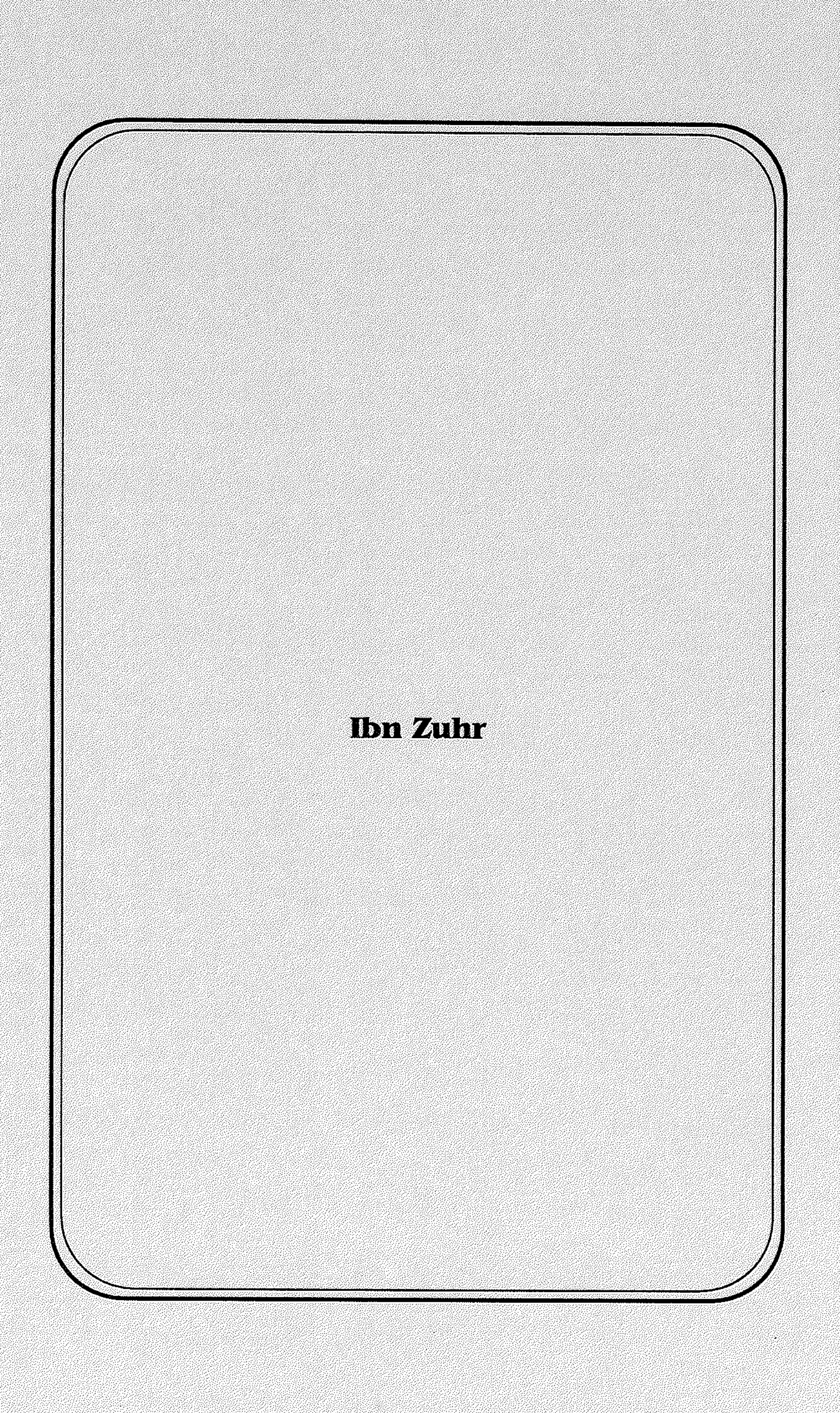
12. General Treatment

Temperament, as used here, signifies a particular 'mix' of the four elements, earth (cold and dry in nature), water (cold and

moist), air (hot and moist) and fire (hot and dry) which gives a distinct pattern of activity and reactivity. Royal treatment (al-Tadbir al-Malaky) was that which required medicines or foods which only the very rich could afford; Simple treatment (al-Tadbir al-Sahl) required less expensive substances; general treatment included medicines, diets or therapies.

For instance, in his discussions on various diseases, Graziani notes that the royal treatment for septicaemia required rose syrup, oxymel (vinegar mixed with honey and sometimes other substances) with snow, barley syrup, violet, Indian watermelon juice and lime, whereas the simple treatment required cucumber juice and cold water! General treatment required emesis followed by drinking Tamarind juice mixed with oxymel, rose syrup and barley juice. The royal treatment for leprosy and elephantiasis required the eating of poultry, duck, goat, spinach and almonds, and the simple treatment called for drinking yoghurt and gargling with sweet almond oil. General treatment was rather complicated, with the patient lying down in a hot, moist place and avoiding beef. "He must anoint himself with violet oil, fat of duck and poultry, and water which is boiled with camomile and melilot. He should take yoghurt, Afithimum (dodder), Ihlaj Kabuli (chebulic myrobalan), Lisan al-Tawer (tongue of the bull borage) and honey. He is also fed meat of snakes."

Ibn Jezla's name is not as famous as that of Ibn Sina or ar-Razi, but it nonetheless deserves a place of honour in the history of medicine. He was a man who appeared on the scene when those who had gone before him had left behind, in Arabic, a substantial body of knowledge about the theory and practice of medicine. He in his turn used this knowledge effectively and adapted a tabular form of presentation, which had previously been used in astronomy, to facilitate the working doctor's (and the layman's) access to medical information. The 'Taqwim' is also a substantial resume of medicine and the 'Minhaj' contains information on the treatment of illnesses which is absent from ar-Razi's works (Leclerc).



Ibn Zuhr

Ibn Zuhr (Avenzoar)

[1092-1161]
"The Wise and the Illustrious"
(Abu Marwan Abdul Malik ibn Abi al-Ala' Zuhr)

"Ibn Zuhr was taught medicine by his father (who held the Canon of Avicenna in small esteem) and achieved great fame as a physician in Spain and North Africa. One of the foremost thinkers of Islam, he was opposed to astrology and medical mysticism....Avenzoar, who took a great interest in materia medica and pharmacy, was opposed to logical distinctions and sophistical subtleties in the practice of medicine... (from Donald Campbell in "Arabian Medicine and its influence on the Middle Ages")

The name Zuhr was not solely that of the man known in the West as Avenzoar. It is, in fact, the patronymic of a family which produced at least six generations of eminent physicians, among whom were Zuhr al-Iyadi (died 1031), Abu Marwan Abdul Malik bin Mohammed bin Marwan bin Zuhr al-Iyadi (died about 1078), Abu al-'Ala Zuhr bin Abdul Malik bin Mohammed (died 1130), Abu Marwan Abdul Malik ibn Abi al-'Ala Zuhr or 'Avenzoar' (died 1161), Abu Bakr Mohammed bin Abdul Malik bin Zuhr al-Hafid (died 1198) and Abu Mohammed Abdullah bin al-Hafid (died 1205). The family originated from Arabia, as the name, al-Iyadi, indicates.

Listing the above is not terribly informative about the men themselves, beyond recording the fact they existed, but it serves to illustrate a point which, though obvious (I think), is only rarely considered. A vigorous culture achieves lasting prestige and influence through the recorded efforts of eminent individuals who are members of it, but the fundamental, lasting success of the

culture depends upon a host of other talented people who buoy it up and indeed provide the impetus which thrusts the eminent few into prominence. The culture of the empire of Islam is no different from any other in this respect. We have been made aware of several hundred illustrious men of medicine from these times thanks to the good works of medical biographers such as Ibn Abi Usaybi'a. We are equally indebted to, and should not forget, the many, many others who, though nameless now, nurtured and sustained medicine over this period. Their personal contributions are unknown to us, but they were the solid bedrock upon which Arabic Medicine was established. In modern parlance, they were the 'human medical infrastructure'.

Abu Marwan ibn Zuhr, known to the West as Avenzoar, Abhomeron Avenzoar or Abimeron, was born at Pentaflor near Seville in Spain. The year of his birth is uncertain. The Encyclopaedia of Islam suggests it to have been between 1092 and 1095: others give the year 1113. Since he is known to have died in 1161 or 1162, the latter date would imply a rather short life span. His early education in medicine was directed by his father, Abu al-'Ala Zuhr, whose own knowledge of medicine and pragmatic approach to it had earned him high esteem among his peers. Abu al-'Ala wrote a treatise on medicine for his son entitled 'at-Tathkhira' (aide-memoire), which is a practical guide for the physician in which he counsels that medicaments should be employed sparingly, the amount being administered to the patient being the smallest amount capable of affecting a cure. Avenzoar's father was also reputed for his learning in religious sciences and literature, and this must certainly have contributed to the son's later eminence in literary and juridical knowledge. Avenzoar was himself so successful as a practising physician and surgeon that he was given the honorary title, "The Wise and the Illustrious". As did Albucasis before him, he practised surgery despite the fact that this aspect of

medicine was looked down upon at this time. He is known to have operated on the lower animals. He was credited with the first total extirpation of the uterus (Herman Baas states that this occurred because he confounded the uterus with an accidental abscess). He realised that no single organ in the body could be considered the most important since all were in a state of obligatory mutual dependence. He did not follow Galen without question. For instance, he contradicted him in insisting that bones and teeth had sensibility.

Ibn Zuhr described and advocated artificial feeding through either the mouth or the rectum. He performed tracheotomies and removed renal calculi (disregarding a persistent abhorrence of this by the ancients). **He described scabies and its causative agent, sarcoptes scabiei,** and was aware of, and wrote on the dangerous character of swamp air.

He described mediastinal tumours (and is said to have died of one), pericarditis and pericardial exudation, intestinal erosions, pharyngeal paralysis and resulting quinsy, salivary concretions under the tongue and consumption from abscess of the stomach. Another of his interests was inflammation of the middle ear.

Apparently, Avenzoar did not travel to the Eastern Caliphate, but he lived and worked in both Spain and North Africa in the service of the Almoravids and Almohads. After an early period in Spain, he was called to Marrakesh and worked there. One of his books, the 'Kitab al-Iktisad'was written in 1121 for Ibrahim bin Yousef bin Tashfin. However, his life was beset with unhappiness and hardship for a period of some ten years when he roused the ire of the brother of Ibrahim bin al-Tashfin, Ali bin Yousef bin Tashfin. The latter insulted him and had him flung into prison where he was abused both physically and mentally. Understandably, he never forgave Ali bin Tashfin for this and, in fact, he refers to him in another of his books, 'at-Taisir', as "the wretched Ali".

However, fortune did smile on him once again, and he was befriended by the Almohad ruler, Abu Mohammed Abdul Mu'min, and was even elevated to the position of vizier under him. He had a very close friendship with Ibn Rushd (Averroes), an equally eminent thinker of the Western Caliphate. In fact, some state that Ibn Rushd was one of Avenzoar's pupils, but this is denied by Arnaldez in the new edition of the Encyclopaedia of Islam. At any rate, Ibn Zuhr was admired by Ibn Rushd to the extent that the latter considered him the greatest physician since Galen. It was at the urging of Ibn Rushd that Avenzoar wrote his major work, 'at-Taisir'.

Ibn Zuhr lived for some fifteen years following his release from prison, and much of his writing was accomplished during this time. He died in Seville in 1161 or 1162, apparently from a mediastinal tumour, after having achieved both wealth and fame.

He is known to have written at least nine books on various subjects. He wrote on drugs and pharmacy generally, on beautification and cosmetics (which then included dermatology), on foods and on diseases including leprosy, vitiligo and those affecting the kidney. 'At-Tathkhira' has been attributed to him by Ibn Abi Usaybi'a, but, as stated earlier. this work is now thought to have been composed by his father on his behalf.

The full title of his largest work is 'at-Taisir fi al Mudawat wa at-Tadbir' (Practical manual of treatments and diets). The work lays stress on the value of experiment, and it details the various ailments and their respective treatment starting with the head and moving systematically down to the feet. It is in this work that a description of mediastinal tumours appears along with the first description of pericardial abscess and notes on intestinal erosions, paralysis of the pharynx, inflammation of the middle ear, artificial feeding, the harmful effects of marsh air and the itch-mite, sarcoptes scabiei, and the affliction it causes. It is also said to

contain "cabalistic recipes" (cabalistic meaning in this case, mystic or occult).

'At-Taisir' is the basis of Avenzoar's renown in the West. It was translated into Hebrew by Jacob in about 1280 and into Latin a year later by Paravicius according to Donald Campbell, who notes that several editions of the Latin version appeared before the end of the thirteenth century and that other translations and printings were produced between the years 1490 and 1553. The work was given the title, 'Abumeron Avenzoar' in the 1490 printing. Interestingly, it also appeared combined with the 'Kitab al-kulliyyat' (The book of generalities) of Ibn Rushd. As previously stated, 'at-Taisir' had been written by Ibn Zuhr at the behest of Ibn Rushd. The 'Kitab al-kulliyyat' was written by Ibn Rushd to complement 'at-Taisir', which dealt with the particulars of medicine. The introduction to the 'Generalities' contains the statement that it was designed to supplement Avenzoar's work.

Another book, the 'Kitab al-aghthiya' (Book of foods) deals with diets, seasoning agents, the actual preparation of food and drink, the rules of hygiene and the subject of medicaments. Pharmacy was a major interest of Ibn Zuhr.

Only three of his books survive. The third of these is 'Al-Iktisad fi islah al-anfus wal asjad' (On the ecology of the treatment and healing of body and soul). This book was written with the non-professional in mind, and it discusses therapeutics and hygiene. It is the book which was written for Ibrahim bin Yousef bin Tashfin.

Arnaldez recounts two tales told by Ibn Abi Usaybi'a which are meant to emphasise to the reader that Ibn Zuhr was a shrewd and intelligent physician. The first concerns his patron, Abdul Mu'min who steadfastly refused to accept purgatives when Ibn Zuhr considered them necessary for his treatment. The clever Avenzoar is said to have sprinkled some grape vines with water adulterated with purgative substances until the plants had absorbed them along with

the water. He then offered the ruler the grapes from this particular vine, and thereby succeeded in administering the purgative.

In the second story, he is presented with a patient who was very large in the belly and who was suffering with an intestinal problem. Avenzoar became aware that the man was accustomed to drink from a water container which looked rather unhygienic. He broke the container to reveal a large frog, and he ascribed the man's illness to this.

In the preceding, Ibn Zuhr can be seen to have used both his intelligence and his experience. he strongly maintained that experience was the sole guide of the physician. He is most remembered as a man who was an adept at the practice of healing. As mentioned previously, Ibn Rushd considered him the greatest doctor since Galen (who lived from 130 to 200 A.D.)

Both Ibn Zuhr and his father died of a malignancy. At the end, Ibn Zuhr declined the advice of his son that he turn to new remedies. He felt that his fate and that of all men was in the hands of God ultimately and that God would decree whether a medicine was to be effective or not.

When he passed on, he left behind a son who was himself a capable physician, a grandson who would have been had he not been poisoned at the age of 25, and a daughter and grand daughter who were skilled and well known midwives. His great grandson later went on to study the works of Galen.

Ibn Zuhr had been born only a few years after the recapture of Toledo by the Spanish Christians in 1085. This event and the beginning of the crusades in 1096 signaled a significant change in Christian Europe. Of course, it was characterised by a more aggressive, militaristic attitude towards the Arabs, and the three centuries of conflict which followed showed how persistent this was to be. However, it is also true that Europe became much more receptive to the knowledge possessed by the Arabs. There had

always been some Europeans who had sought out this knowledge and that of the Greeks. It is reported that even during the time of the caliph al-Ma'mun. some of the Arabic translations of Greek medical works had themselves been translated into Latin for the benefit of the West. However, Donald Campbell notes that such manuscripts - if indeed they really existed - are no longer to be found. In about 1130 or so, Archbishop Raymond set up a Society of Translators headed by Archdeacon Dominicus Gundisalvi with the aim of acquiring the knowledge extant in Arabic manuscripts as quickly as possible. This is strongly reminiscent of al-Ma'mun's House of Wisdom, founded three centuries earlier by the Arabs. Toledo became an important centre for this work. This School of Translators has been criticised for its method of translation. They tended to make word for word translations, which often warped the sense of the original Arabic. On occasion an Arabic word whose meaning was unknown to the translator would be simply transliterated, forcing the reader to guess as to its meaning. After the fall of Cordoba to the Spaniards in 1236, it and Seville became other Spanish points of access to the culture of the Western Caliphate (the University of Seville remained strong in the study of Arabic). Jewish scholars are credited with most of this early work.

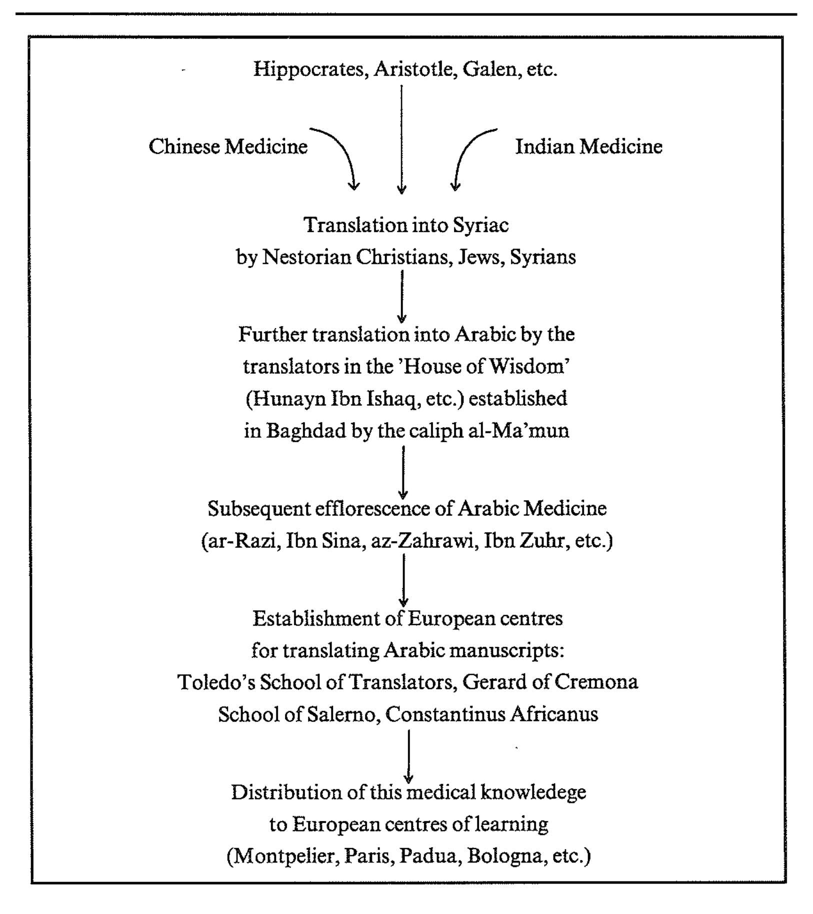
Salerno in Italy was the second principal source of Arabic knowledge. This was largly due to Constantinus Africanus, who lived from 1020 to 1087. He was born in Carthage, Tunis, and lived for many years as a slave. He was nonetheless a very talented man, well versed in both Arabic and Latin. He is said to have visited Italy where he found medicine to be in a very bad state and to have decided to return to Tunis to perfect himself in the discipline after which he returned to Italy, settled eventually in the Benedictine Monastery of Monte Cassino and then translated prodigious amounts of Arabic medical works into Latin. For some reason, he attributed these translations to himself (as if he were the original

author). The first assumption would naturally be that he was simply a plagiarist, but it is also possible that he was coerced into this by those in positions of power who wanted to suppress the Arabic origins of the manuscripts. In any event, and in spite of this, Constantinus succeeded in reviving the School of Salerno (called the Mother of Universities in Europe) and this led to its playing the important role it did in passing on Arabic knowledge.

Gerard of Cremona (in Lombardy), who lived from 1114 to 1187, went to Toledo some forty years after the setting up of the Society of Translators. After he had acquired a good knowledge of Arabic thanks to the tutoring of one Ibn Ghalib, he began a brilliant career in translating from Arabic into Latin. Besides works from the Western Caliphate (az-Zahrawi, for instance) he also translated the writings of ar-Razi and Ibn Sina (among others) thereby giving the West access to the knowledge of the Eastern Caliphate as well.

Arnald of Villanova (1235 - 1312) belonged to the School of Montpellier, which was one of the early European Universities. Described as the "alchemist of Arabo-scholastic medicine" by Donald Campbell, Arnald drew primarily on the works of Ibn Zuhr.

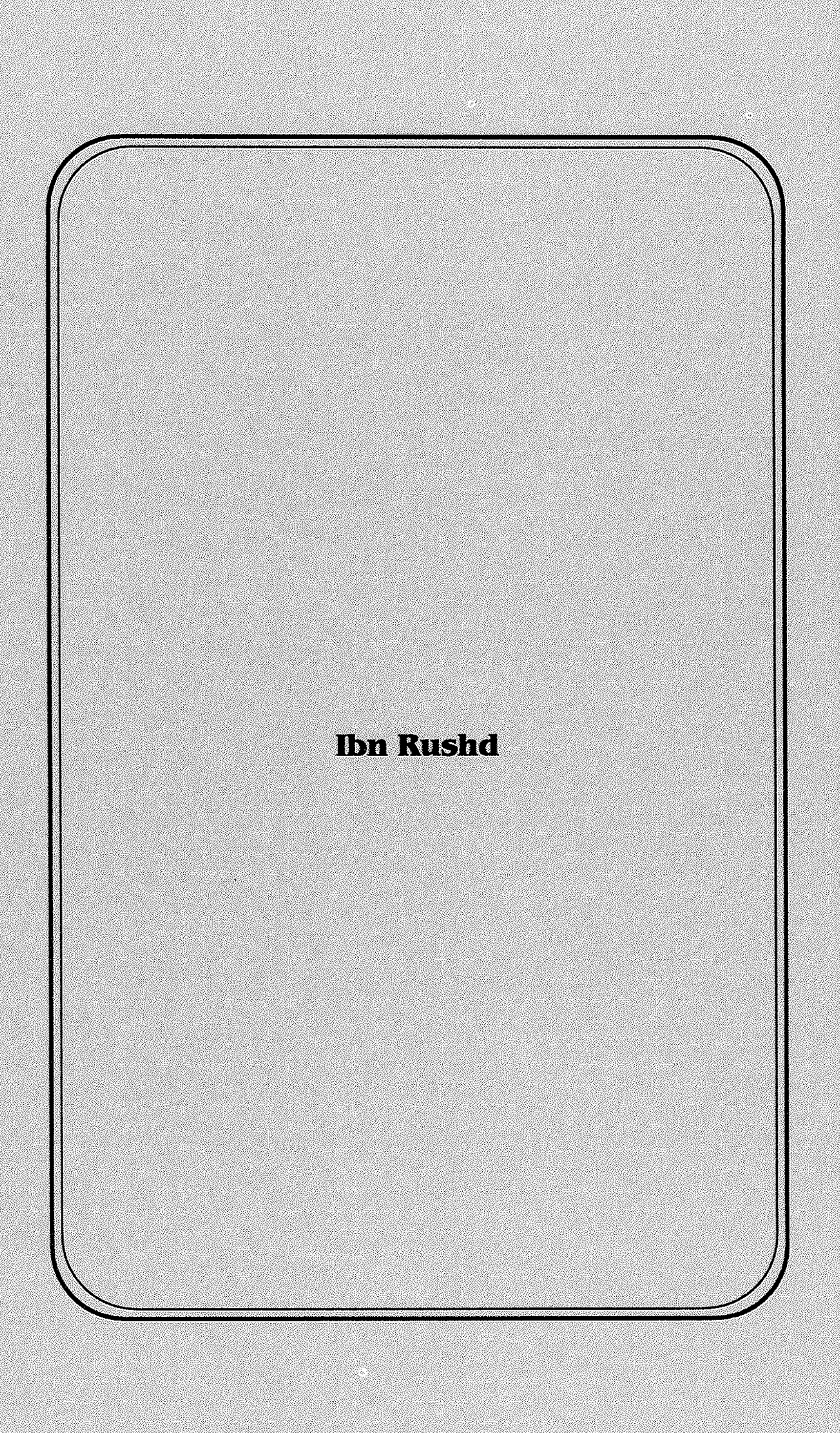
The effect of this influx of Arabic knowledge on Europe is assessed by Donald Campbell as follows: "The Scholasticism of mediaeval times was in the main a direct outcome of the Arabic revival in Europe; the expounders of mediaeval medicine drew on the Arabic material (in their Latin translations) thereby completely arabising the system of medicine in Europe". It is apparent therefore that Arabic Medicine is not important in and of itself alone (although this is sufficient reason for an interest in it). It is equally important because it, together with the Greek, Indian, Chinese and other sources which it assimilated, became the basis of European Medicine. The way in which this happened has been explained in this and preceding "Cameo Sketches'. It is summarised in the figure which follows.



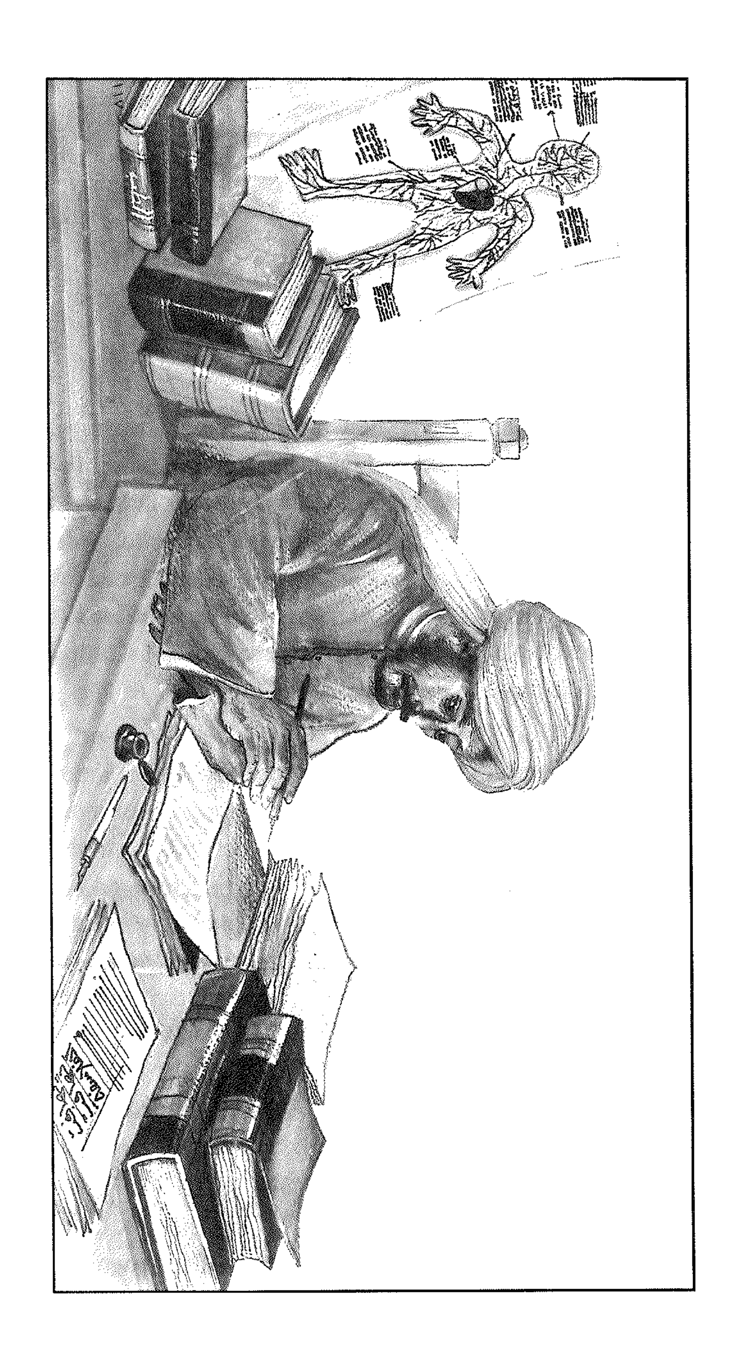
Legend to figure: *The medical knowledge of the Greeks and, to a lesser extent the Indians, Chinese and Persians was translated into Syriac and then into Arabic (or directly into Arabic) where it stimulated the founding of Arabic Medicine. This was eventually passed on to Europe in turn through translation into latin.*

Acknowledgement

I am very grateful to Mr. David Collins for his having made available literature used in preparing this article.



Ibn Rushd



Ibn Rushd (Averroes)

[1126 - 1198]
"Commentator on the writings of Aristotle"
(Abu al-Walid Mohammed ibn Ahmad ibn Mohammed ibn Rushd)

"Living as he did at the time of intellectual retrogression, religious bigotry, moral decay, and the feeble political power in Islam, Averroes' fame among the Moslems passed away with his death by the end of the twelfth century. But his system of Aristotle, which was adopted by the Spanish Jews and through them carried over to Christian Europe, led to Averroes looming large in the West as one of the most influential of the Arabians." (from Donald Campbell in 'Arabian Medicine and its influence on the Middle Ages')

The life of Ibn Rushd (Averroes) spanned a period in the history of the Western Caliphate which constituted an interval of calm in what was overall a particularly unhappy era. For more than a century prior to his birth, factional conflicts involving the Caliphate's major sub-populations, the Berbers, Slavs and Andalusians, had sapped its vitality and led to the setting up of many small 'kingdoms' within it. The petty kings of these regions (Muluk at-Tawa'if) pursued short-sighted, selfish aims which weakened the Caliphate and facilitated the beginning of its reconquest (Reconquista) by the Christians to the north. In fact, the situation had indeed become so chaotic that when Toledo was retaken by the Christian king Alfonso VI in 1085, clever negotiating on his part allowed this to be accomplished without military resistance being offered by the Caliphate.

The rulers of these small kingdoms eventually recognised their imminent peril, and they sued for the assistance of the North

African Almoravid ruler, Amir Yusuf bin Tashufin. The amir did indeed come to their assistance, and he decisively defeated Alfonso VI at Sagraja in 1086. Notwithstanding this respite given to them, the petty kings persisted in their disunity and, in the end, Yusuf bin Tashufin was compelled to remove them from power one by one, with the result that Spain was effectively annexed by North Africa. During Ibn Rushd's life, once proud Andalus (Spain) languished as an appendage of North Africa, subject to the latter's Berber rulers. His successful career was possible because of several decades of peace and stability which resulted from the annexation, and the difficulties he faced in his later years arose from the resurgence of factionalism, in a religious form, towards the end of this prosperous period.

Ibn Rushd was born in Cordoba in 1126 into a distinguished family of jurists. Both his grandfather and father were eminent 'Cadis' with important juridical and administrative duties in the Caliphate. His studies included the Qoran and the Malekite system of law, as well as medicine, philosophy and astronomy. He is said to have had a particular interest in the 'sciences of the ancients' which Arnaldez (Encyclopaedia of Islam) suggests was the knowledge of the Greeks. He was of course a friend (some say a pupil as well) of Ibn Zuhr. Since Ibn Zuhr died when Ibn Rushd was 36 or 35, their association occurred during the productive years of both of them.

The philosopher, Ibn Tufayl, was also a friend and colleague, and it was he who introduced Ibn Rushd to the Caliph Abu Yaqub Yusuf in 1169. Although Ibn Rushd was perplexed at being asked by the caliph whether the heavens were created or not (the caliph is said to have answered his own question), his subsequent conversation impressed the caliph to the extent that he rewarded him with expensive gifts and extended his favour towards him. When Ibn Tufayl was asked by the caliph to write a clear and understandable commentary on Aristotle, this task was passed on by him to Ibn

Rushd. The latter applied himself to it for many years (from 1169 to 1195) with diligence and persistence and he is described by Campbell as "the truest follower of Aristotle among the Arabians". He aspired himself to the title, "Commentator on the writings of Aristotle", and it is the opinion of most that he earned it.

Ibn Rushd is described as an Aristotelean and a Neo-platonist (one who, according to Webster, views the world as "an emanation from the One within, with whom the soul is capable of being reunited in a trance or ecstasy"). He was also said to ascribe to pantheism, and he was attacked by the Islamic theologians (mutakallimun) as well as the Christian Church on account of this. However, he held that the best religion for a Muslim was Islam, of which Mohammed is its prophet. He also held that it had superseded the previous religions of Judaism and Christianity. He disagreed with Plato in insisting that religion is for all irrespective of class. He stated that the contents of the Shari'a are the whole and only truth for all believers, and that religious teachings on reward and punishment and the hereafter must be accepted in their plain meaning by the elite just as they must be by the masses. He advocated that women should have a position of civic equality.

He felt that the aim of philosophy was to discern the true, inner meaning of religious beliefs and convictions. He considered that the knowledge of the essence of religion so gained should not be made available to the ordinary people, who were obliged to accept the scripture as it was explained in stories, similes and metaphors.

He is known to have been in Marrakesh in 1153 (he would have been 27 then) possibly assisting Abdul Mu'min in the setting up of colleges. Certainly, he was engaged in astronomical work at this time, and he was interested in studying the movements of the planets to give the science of astronomy a physical as well as an mathematical basis. His later eminence in juridical and administrative affairs in Seville, Cordoba and in Morroco seems to have

prohibited him from following this up, as Arnaldez quotes him as having written,"I hoped in my youth that it would be possible for me to carry out this research successfully; but now I am old I have lost this hope...."

Eventually, because of his renown as a physician, Ibn Rushd succeeded Ibn Tufayl as personal physician to the Amir Abu Yaqub Yusuf, and he held the same position under Abu Yaqub's son, Abu Yusuf Yaqub. He became the chief Cadi of Cordoba, and performed similar duties in Seville and Marrakesh. Indeed, his consternation concerning the amount of time these duties required is recorded in his writing. Some of his medical opinions were quite original for his time. He claimed sensibility for the heart, but considered it otherwise simply the place of origin of the arteries. He described the function of the retina. He realised that someone once afflicted with smallpox would never again contract it. He considered that conception was brought about by the ethereal principle in semen alone. It is said that he was convinced on this latter point by the persuasive protestations of a woman who had become pregnant without the assistance of her husband and who suggested this must have happened by her bathing herself in water used by someone before her. He didn't believe in the use of mathematical formulae for the compounding of remedies. He tended to support the views of Aristotle over those of Galen where they disagreed (and gained the reputation of disagreeing with Galen because of this).

It was in the latter part of the reign of Abu Yusuf Yaqub (Yaqub al-Mansur) that Ibn Rushd's position as a philosopher was the cause of his falling from the positions of responsibility and power that he had occupied for so long. The ruler was deeply involved in resisting the Christian advance from the north, and he found that he badly needed the support of the fuqaha' (experts in interpreting matters of religion). This situation arose because religious factionalism had led to the ascendancy of the orthodox views on Islam with the result that the

population had become intolerant of philosophers and the like who were known to hold opinions divergent from those insisting on a strict interpretation of religion. Because the ruler needed the support of his people in his struggle against Christianity, he was obliged to bow to the demands of the fuqaha' that Ibn Rushd be removed from his privileged station. One story has it that he was removed from office in 1195 and banished to Lucena, outside Cordoba. The study of philosophy was forbidden, and an order was given out that all books on the subject be burnt. During the time that Ibn Rushd was being persecuted, he is said to have been succoured by Maimonides (who may have been a pupil of his), who was a Spanish Jew who was said later to have become physician of the great Salah ad-Din, and who treated Richard the Lionheart, Salah ad-Din's great adversary in the wars of the crusades. Some say that Ibn Rushd died in 1198 during his disgrace. Others state that when he returned to the more tolerant North African city of Marrakesh, he was restored to favour by the caliph. At any rate, he did pass away in 1198, and was initially buried in Morroco, but later disinterred and reburied in the family vaults in Cordoba.

His philosophical views continued to be unacceptable to the higher authorities in both Islam and Christianity even after he died, and his fame faded in the Islamic world. Of course, at this time he was unknown to the West. It was the Jewish community in Spain which preserved his work for posterity and ensured his later fame in Europe. For a long period this community had enjoyed a tolerant asylum in the Western Caliphate where it flourished intellectually. Some of its members took up Ibn Rushd's philosophical works with enthusiasm. They adopted his system of Aristotle and spread it throughout Europe when they were forced to leave Spain and flee to the south of France and Italy. Indeed, many of Ibn Rushd's writings no longer exist in their original Arabic form. Instead, they are found in their Hebrew or Latin versions.

His major medical work is the 'Kitab al-kulliyyat' ('Colliget'in Latin), and it is the second half of a work in two parts by two authors which arose from the close and productive association of Ibn Rushd and Ibn Zuhr. Ibn Zuhr's 'at-Taisir fi al mudawat wa at-tadbir', which formed the first part of this combined work, dealt with the particularities of medicine. Ibn Rushd's 'al-kulliyyat' is a general resume of medicine with sections on anatomy, physiology, pathology, symptomatology, food and medicines (including poisons), hygiene and therapeutics. It was written by him between the years 1162 and 1169. Ibn Rushd himself intended that the two above works should form a comprehensive study of the whole of medicine.

Much has been written about Ibn Rushd's opposition to Ibn Sina's writings. He certainly disagreed with the latter's interpretation of Aristotle, but he had great respect for Ibn Sina's medical knowledge. There still survives a commentary written by him on Ibn Sina's 'Canticum de medicina'.

It must be said, however, that his major interest seems to have been philosophy. His meeting with Abu Yaqub Yusuf which was so decisive for him, leading to his being elevated to a position of great power and influence, also set him the task of interpreting the writings of the Greek philosopher, Aristotle. Ibn Rushd worked for most of the rest of his life on this (from 1169 to 1195). The Encyclopaedia Britannica notes among his commentaries those on Aristotle's 'Organon', 'De anima', 'Physica', 'Metaphysica', 'De partibus animalium', 'Parva naturalia', 'Meteorologica', 'Rhetorica', 'Poetica' and 'the Nichomachean Ethics'. He also wrote on Plato's 'Republic'. It is said that the great English philosopher, Roger Bacon, wrote that nature had been interpreted by Aristotle, and that Aristotle had been interpreted by Averroes (Ibn Rushd). Using his familiarity with Islamic traditions and his knowledge in

depth of Greek thought, Ibn Rushd amalgamated the two and created a system of his own.

Ibn Rushd held that it was the solemn duty of a philosopher (laid upon him by God) to use his superior reasoning powers to extract and explain the crucial points of belief in religion and to ascertain the essence of religious truth. Such a stand naturally gained him adversaries among theologians who understandably took a different point of view. He was able to resist the orthodox theologians for a very considerable period because he had the protection of the ruler, who was sympathetic to the ideas of philosophy. His fall from grace, when it did come, was not due to a sudden upwelling of intolerance on the part of the people so much as it was due to a 'strategic' change of heart on the part of Yaqub al-Mansur.

The 'Kitab al-kulliyyat' was translated into Latin by the Jew, Bonacosa, in 1255 at Padua. A Latin translation was also published in Venice in 1482, and a further printing in Latin in 1531 was part of a combined edition including the works of ar-Razi, Serapion Junior and Avenzoar. His commentary on Ibn Sina's poem, 'Canticum de medicina' was translated into Hebrew in about the year 1260 by Moses ben Tibbon. Herman the German (a teacher of Roger Bacon?) translated his commentaries on Aristotle's rhetoric and poetry in 1256. Michael Scot translated the commentaries on 'De generatione et corruptione', 'De anima', 'De sensu et sensato', 'De substantia orbis' and 'De metaphysica'. Other commentaries translated were on 'De introductio porphyrii' (by William de Lunes), 'Tract. de theriaca' (by Andreas Alpagus) and 'Tract. de separatione primi principii' (by Alfonso of Toledo). By the end of the thirteenth century then, the great body of his works had been translated into Latin.

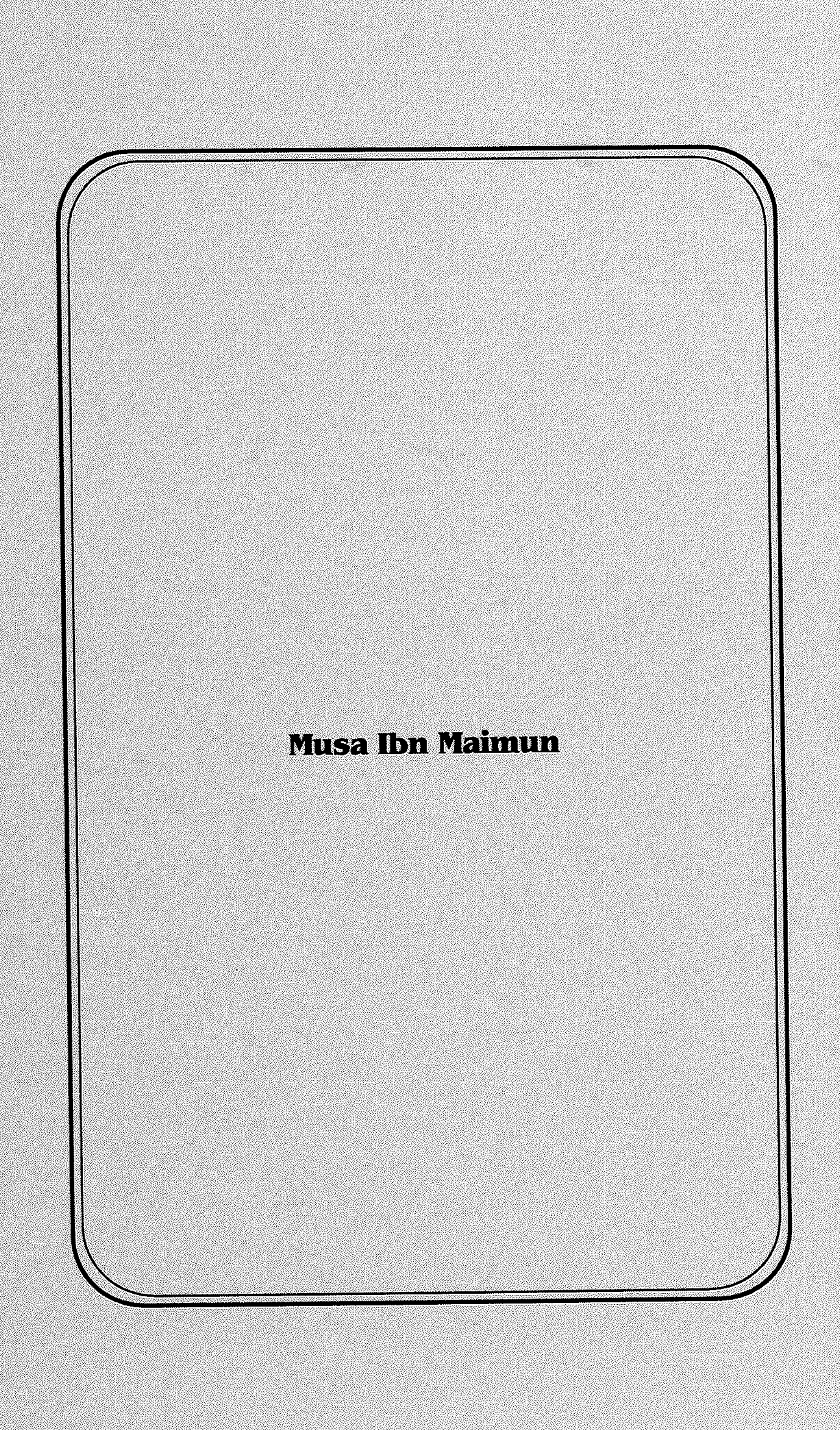
Ibn Rushd's contribution to medicine was considerable, and his 'Kitab al-kulliyyat' is a memorial to his eminence in this field in his

own age. It was also one of the means by which European medicine was reborn and, in this respect, it was but part of the overall Arabian body of medical knowledge which played such a crucial role in this renaissance. Ar-Razi and Ibn Sina were the major sources of Arabian medical knowledge, and Ibn Rushd, although a significant contributor, played a secondary role. However, in the field of philosophy, his influence was paramount. Not only was he for a long period the interpreter of Aristotle, he was also the originator of his own philosophy which sought to meld the views of Aristotle and the tenets of Islam into a new system of thought. In the words of 'E.I.J.R' in the Encyclopaedia Britannica, "the unity of outlook on Averroes' religious, philosophical writings and his commentary on the 'republic' gives his political philosophy a distinctly Islamic character and tone, thereby adding to his significance as a religious philosopher". M.M.Siddiqi notes that Louis XI of France made Ibn Rushd's books compulsory subjects in 1473, and that Ibn Rushd's philosophy was taught at the University of Padua till the end of the seventeenth century. He exerted a major effect on the thinking of such outstanding Europeans as Roger Bacon and Saint Thomas Aquinas, and his memory still endures, some eight hundred years after his death.

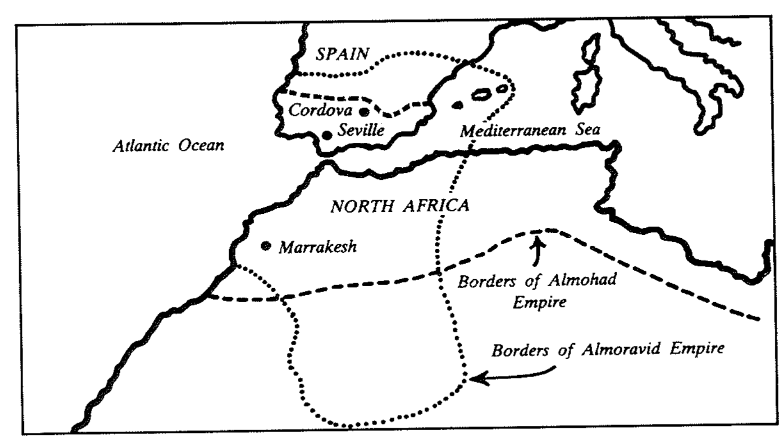
Acknowledgement

I am most grateful to Mr. David Collins for his assistance in obtaining for me literature on the life and thoughts of Ibn Rushd.

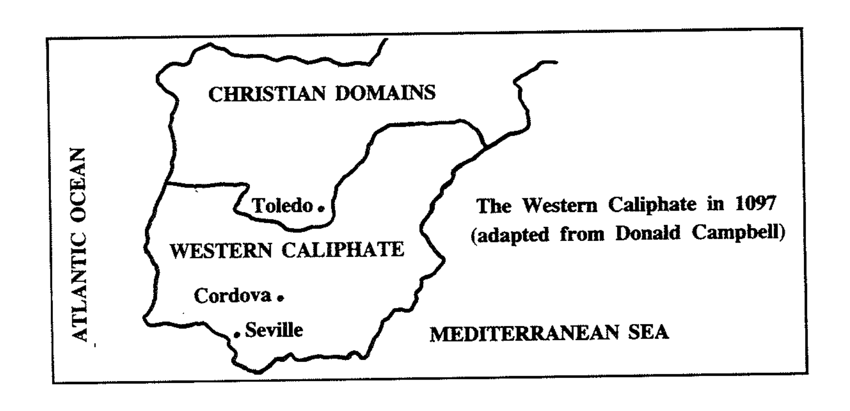




Musa Ibn Maimun



Adapted from the Times Concise atlas of World History



The Western Caliphate in 1097 (adapted from Donald Campbell)

Musa ibn Maimun (Maimonides)

[1135 - 1204 A.D.]
(Abu Imran Musa ibn 'Ubaid Allah ibn Maimun Al-Cordobi)

"While in Cairo, he lost his entire fortune, and turned to medicine for a living. His professional career was a most profitable one, as he enjoyed great fame and became body physician to Saladin. He is said to have refused a similar appointment to Richard I of England .....Maimonides, who very materially helped to establish an Averroistic school in the West of Europe, was a contemporary of Averroes [Ibn Rushd]" (from Donald Campbell - "Arabian Medicine and its influence on the Middle Ages")

The general attitude in the Empire of Islam to other religions was one of tolerance. Indeed, this tolerance had been the key to Baghdad's obtaining the services of many eminent non-Muslims such as Hunayn Ibn Ishaq whose translation of older Greek texts formed the basis for the development of Arabic Medicine during its 'Golden Age'. The same tolerance had existed in the Western Caliphate, and this had led to the emergence of flourishing Jewish settlements (madinat al-Yahud) in most of the cities and towns of Andalus (i.e., Muslim Spain). Jewish people even took part in the administration of Spain and were said to have played a leading part in commerce between Muslim Spain and Europe. Indeed, Ezzat Abouleish quotes Rabbi Minken as follows; "It was Mohammedan Spain, the only land the Jews knew in nearly a thousand years of their dispersion, which made the genius of Moses Maimonides possible". When Jewish authors in Spain wrote on topics other than the Hebrew religion, the language most often used was Arabic. This

stems not a little from the fact that their study of the ancient texts was through their Arabic translations.

Maimonides was born in Cordoba in 1135 (1139?), the son of an eminent rabbi who was himself from a family which had lived successfully for several generations in Spain. His father ensured that he received a thorough education, and at an early age, he was already astonishing those around him with his erudition and intelligence. However, he and his family - and indeed the Jewish population generally in Spain - were faced with very difficult times following the conquest of Muslim Spain by the Almohades, who occupied Cordoba in 1148 A.D. when Maimonides was about 13. The usual Islamic tolerance for minorities was unhappily lacking in these people from North Africa, who insisted on Jews in Spain accepting Islam or leaving Muslim Spain. Maimonides' family finally did leave Spain for Fez in what is now Morocco, in about the year 1160 A.D. when he was about 25, and it was there that he added the study of medicine to that of religion and the sciences. The family stayed in Fez for about five years (some suggest a period of ten years) at which point they moved to Palestine (after the execution of one of Maimonides' teachers, Rabbi Judah ibn Shashan). Because Palestine was lacking in opportunities by which the family might make a living, they shortly thereafter moved once again, this time to Al- Fustat (Cairo), where they once more found the acceptance and the tolerance they had previously known in pre-Almohad Muslim Spain. The family set up in business, and were successful and seemingly secure when a tragic shipwreck took the life of Maimonides' brother and all the family fortune. As his father had died earlier (after they had come to Cairo) the responsibility for the family suddenly fell on Maimonides alone.

His misfortune visited him at a time when the situation in the Eastern Caliphate seemed most perilous. Indeed, some time before this, the caliph in Baghdad had lost any real power to his vizier, and

a Fatimite caliph ruling in Egypt was hostile. The Seljuk (Turkish) occupation of parts of the Eastern Caliphate was a further complication, although the Seljuks had earlier defeated Byzantium in 1071 A.D. The Arab centre of Islam had therefore been divided, and faced by a seemingly ascendant Christian power from Europe which had created a Christian kingdom of Jerusalem (in 1100 A.D.) and had made other inroads into the territories roundabout in the form of principalities created as a result of the first crusade.

However, there arose a line of sultans from among the Seljuks who were to change this situation. They stemmed from the city of Mosul on the Tigris, and by their energy and their ability to unite those who had been divided they gradually recouped most of the losses to the Christians. They were ably assisted in this by two Kurdish brothers, who first served the sultan Zengi and afterwards Zengi's son, Nureddin as generals. They were Shirguh and Ayyub. In the final stages, Ayyub's son, one Nasser Salah ad-Din al-Ayubi, became the ruler of Egypt, and was able to reconcile it with Muslim Syria which he also came to rule shortly after the death of Nureddin. This is the Salah ad-Din who is remembered in the West as the legendary Saladin. Perfect in his devotion to Islam and resolute in his determination to regain the holy lands, he was able to win the hearts of his subjects and steel them for the task of sweeping away the Frankish Kingdom of Jerusalem, notwithstanding the presence of the equally brave and chivalrous Richard the Lionheart.

Because of Saladin, who was just as firm in his insistence on tolerance for religious minorities living under his protection as he was fierce and implacable in his drive to free the holy lands, the Egypt in which Maimonides lived was a place in which Jew or Christian could live secure and productive lives in spite of the turmoil roundabout. He founded the Al-Nasseri Hospital in Cairo.

Although Maimonides was capable of working as a rabbi (it is reported that he served as rabbi of the Jewish community of Al-Fustat), it was the custom at this time to perform such religious duties without recompence. He was virtually penniless and therefore could no longer engage in commerce. At this point he turned to medicine, which he described as "the strange woman whom I first took into my house as handmaiden to the Torah". G. Vajda (Encyclopaedia of Islam) states that he began his medical career as a protege of the Vizier Kadhi al-Fadhil. Although he is described as being best known as a theoretician, his practical abilities were such that he was soon very successful. He not only ran a very busy private practice, but also lectured to his peers at the state hospital It is said by some (and doubted by others) that he was ordinary physician to the great Saladin himself. The story is also told that he was sent by Saladin to tend the Christian King Richard the Lionheart, and that Richard asked him to serve as his physician. Certainly Saladin and Richard had the greatest respect and, it would seem, affection for one another, and the story may not be apocryphal. Maimonides declined Richard's request, according to the story told of the incident. He is known to have served as physician to the son of Saladin, the Sultan al-Malek al-Afdhal and indeed some of his writings were directed to him.

He became eminent in medicine, theology, mathematics, astronomy and jewellery. Among the great men who had preceded him, he is said to have found most inspiration from Al-Farabi. He was very familiar with Ibn Sina (indeed, he translated his 'Qanun' into Hebrew) and he strongly supported Ibn Rushd. Since Maimonides left Spain at a relatively early age, the claim that he was a pupil of Ibn Rushd has been questioned. Ibn Rushd was in Marrakesh in 1153 A.D., and Maimonides was also in North Africa from the year 1160 A.D., as has been mentioned. Did they perhaps continue an earlier relationship there ? With respect to Ibn Rushd,

there is another story that Maimonides was instrumental in persuading the Jewish community in Spain to succour Ibn Rushd during the time when he was being persecuted for his views. This is possible if this influence was exerted from Fez or further afield, but it seems unlikely that it could have occurred while Maimonides was still in Spain, since he had left there long before the time of Ibn Rushd's fall from grace. What is most certainly undeniable is that it was through the writings of Maimonides that Averroism (the movement which supported the views of Ibn Rushd) became a very strong influence among the intellectuals of Western Europe. Maimonides was a very ardent supporter of the views of Ibn Rushd.

Both during his life and afterwards, the writings of Maimonides on Jewish theological matters stimulated much controversy, and their effect has been lasting.

Maimonides died in 1204 (some say 1208), leaving a son, Abraham who became a prominent Jewish scholar himself. Abouleish notes that, in his honour, the Jewish community in Cairo built a synagogue to which they gave his name, and which is still visited by some Jews in the hope of obtaining cures through the intercession of his spirit. There have in fact been recent moves (1996) by some in Egypt to renovate this synagogue as a tribute to Maimonides. He was buried in Tiberias, Palestine, and a shrine was built to him which still exists and is visited by his admirers.

According to "B.Z.B." of the Encyclopaedia Britannica, Maimonides' first (surviving) written work was composed when he was only 16. It is a 'Treatise on Logical Terminology' It was followed by 'An Essay on the Calendar'. He wrote several other works devoted to religious matters of which 'The Guide for the Perplexed', which occupied him for fifteen years, must be his most well known non-medical work. In it he sought to reconcile science, philosophy and the Hebrew religion. The work was written in Arabic originally, but it was translated into Hebrew during his

lifetime by Rabbi Moses ben Samuel, and subsequently into Latin and most modern European languages by others. "B.Z.B." notes that this work has had a considerable effect on the development of religious thought.

It is of course for his medical writings that he is best remembered by those in that field. He wrote the 'Book of Counsel' - put out in the form of letters to the Sultan al-Malek al-Afdhal. It consists of four major subsections on rules for maintaining health, first aid where medical assistance is not readily available, personal advice to al-Afdhal and matters useful "to sick and well in all times and places".

Perhaps his most famous medical work is 'Aphorisms of Hippocrates and Galen' (Kitab al-Fusul fi at-Tibb), which he is said to have written between 1187 and 1190 A.D. It contains some 1500 aphorisms [Webster: aphorism = a terse formulation of a truth] based on the writings of Hippocrates and Galen to which he appended some criticisms in his 25th treatise. It was translated from the original Arabic into Hebrew by Rabbi Nathan Amathi. Later Latin translations were printed in Bologna in 1489 and in Basle in 1579.

Maimonides himself translated Ibn Sina's 'Qanun' into Hebrew. He wrote a work on haemorrhoids in which he drew extensively from Ar-Razi, Ibn Sina and Ibn Wafid.

He answered the order of of Kadhi al-Fadhil "to write a short and concise manual of first aid to the bitten person" by composing his 'Treatise to the Honoured One' or 'Treatise of Fadhil' which is more commonly known as the 'Treatise on Poisons and their Antidotes'. This work has been very widely translated from the original Arabic version which appeared in 1198 A.D. Moses ibn Tibbon translated it into Hebrew in the thirteenth century. Armengaud de Blasius of Montpellier produced a Latin version. J. M. Rabinowitz produced a French version which was published in

1865 and Steinschneider produced a German translation (from the Hebrew) in 1873. An English translation was made of Steinschneider's German work by Bragman in 1926, and a new English translation directly from the Arabic was produced in 1966 by Muntner.

Fred Rosner wrote a detailed description of the work in 1968. It begins with a panegyric in praise of the Vizier al-Fadhil which includes a recounting of His Highness's order that remedies not available in Egypt be imported and made available to those suffering from poisonous bites or stings.

The treatise proper deals in its first chapters with bites of snakes and mad dogs, and stings of scorpions, bees, wasps and spiders. Rosner quotes Maimonides' instructions for the care of the patient poisoned by such bites or stings which should begin by tying off the spot above the wound, followed by using a lancet to make cuts above the wound and sucking the poison from these cuts. The hazard of an open wound in the mouth of the person sucking out the poison is pointed out, cupping being suggested as an alternative in such a case.

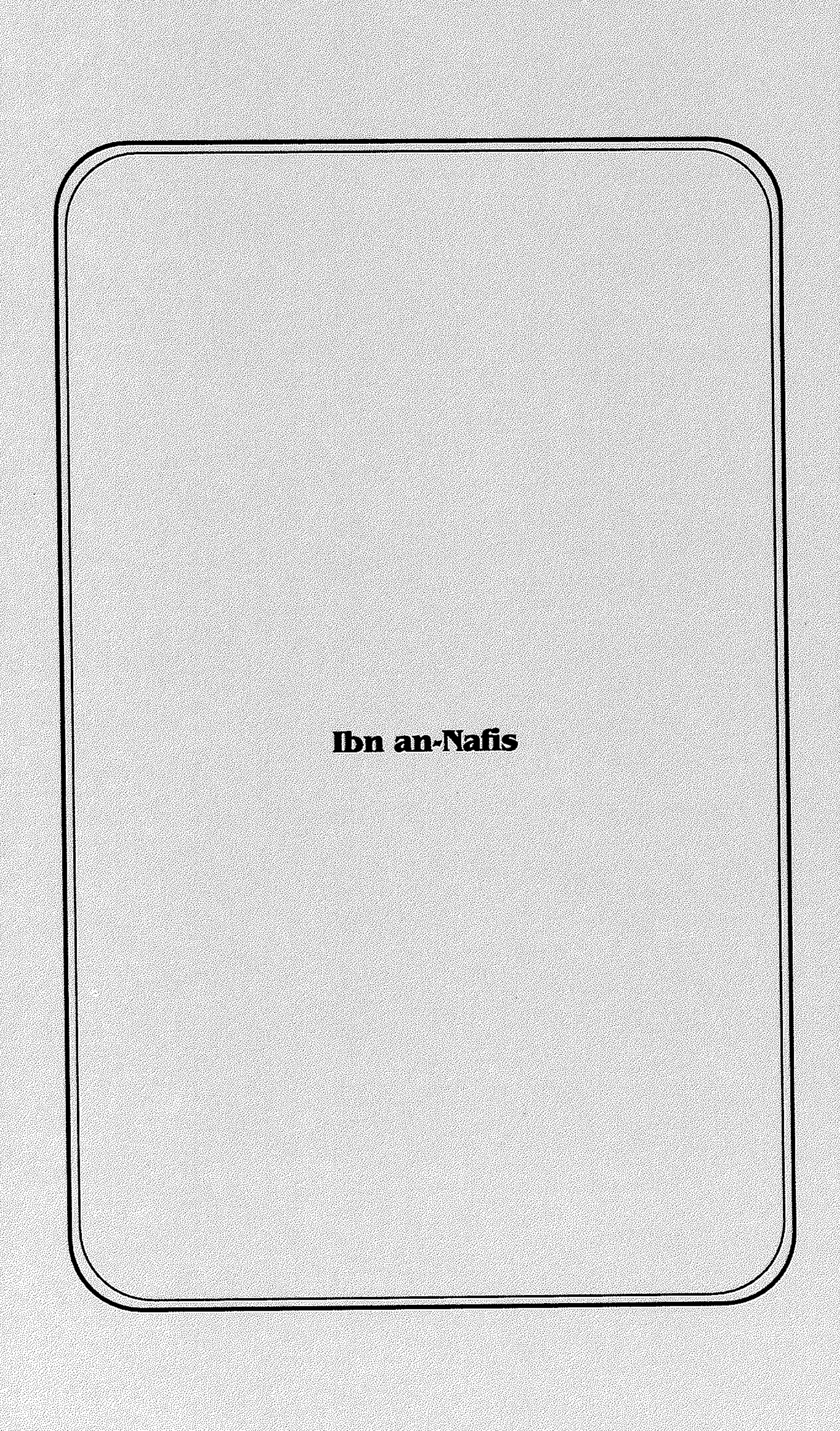
Simple and compound remedies for external use are described, as are simple remedies intended for ingestion. Some medicines should be taken with wine, but for the devout Muslim, aniseed may be used instead. Specific theriacs are described, such as "the asofoetida of ar-Razi, the nut theriac, the onion theriac of Ibn Zuhr, the electuary of Avicenna and the antidote of Galen". Specific remedies are also described. Particular and general diets for the patient are included. In passing, Rosner notes that Maimonides was aware of the long incubation period of rabies.

Vegetable and mineral poisons are dealt with in the second section, and the necessity of taking pains to avoid being deliberately poisoned is stressed. The use of emetics in such cases is described as

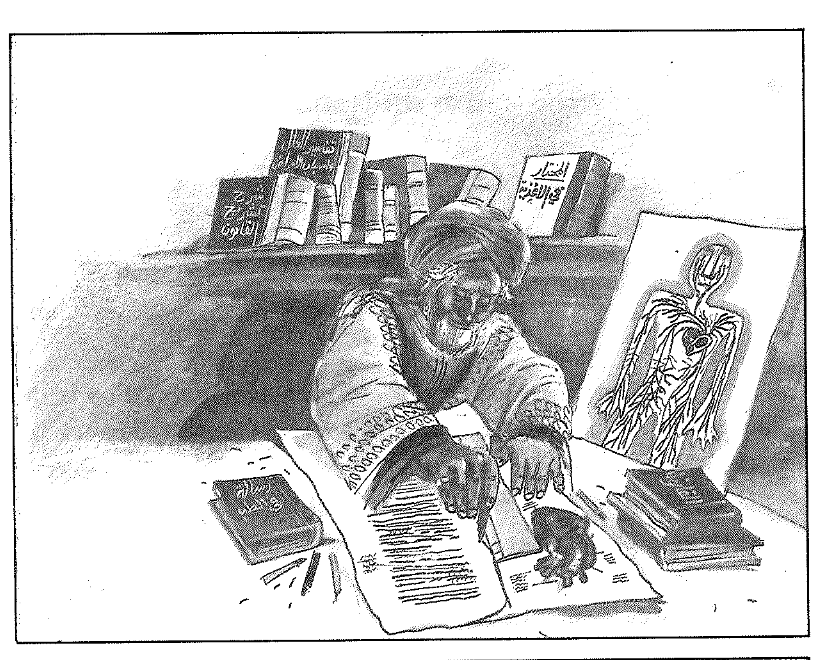
are the simple and compound remedies available. Maimonides notes that Ibn Zuhr was most skilled at treating poisoning.

The final section of the treatise deals with treatment where the nature of the poison is known. Rosner notes that it includes excellent descriptions of the symptoms of belladonna poisoning and the ingestion of cantharides. He concludes, "the Treatise on Poisons shows Maimonides to be a scientist who did not abide by medical dogma but experimented for himself or accepted the valid investigations of others. His originality, conciseness and lucidity are reflected in every chapter".

Maimonides is, it is claimed, the original from whom Sir Walter Scott patterned his "El-Hakim" in his novel, 'Talisman'. As a man whose original works on philosophy and religion are still influencing us after almost 800 years, he must rank as an original thinker of genius. His espousal of the views of Ibn Rushd (Averroes) did much to spread these views to Europe, and his own medical works which were widely circulated in Europe in translated form (he wrote at least twelve) have earned him a place of honour alongside ar-Razi, Ibn Sina, Ibn Zuhr, Hunayn Ibn Ishaq and the other eminent figures in medicine who were nurtured and flourished under the aegis of the Empire of Islam.



Ibn an-Nafis


المختار
في الأغذية



Ibn an-Nafis

[1210 - 1288 A.D.]
"The second Ibn Sina"
(Ala' ad-Din Abu al-Ala' Ali ibn Abi al-Haram al-Kurashi al-Dimashki)

"Credit for "the discovery of the pulmonary circulation is the prerogative of Ibn an-Nafis.....It is in no way our intent to diminish the roles of Harvey and the Italian physicians of the sixteenth century in the discovery of the circulation of the blood; we propose solely to render unto Caesar that which is Caesar's and unto Ibn an-Nafis that which is Ibn an-Nafis's" (translated from "Ibn an-Nafis et la decouverte de la circulation pulmonaire" by Abdul Karim Chehade)

The whole of Ibn an-Nafis's life was lived against a backdrop of crisis and catastrophic change. At this time, Cairo and Damascus were two important centres of learning in the Arab world, with Baghdad having become less important, probably due to the changes that had occurred during the Crusades which took place in the 11th, 12th and 13th centuries. At the beginning of Ibn an-Nafis's life, both Egypt and Syria were ruled by al-Malik al-Adil Sayf ad-Din, the brother of the famous Salah-ad-Din (Saladin). The region as a whole was disturbed by military disputes of Salah ad-Din's heirs who were jostling for power, and the influence of the much-weakened caliphs of Baghdad (themselves at war with the shahs of Khwarazm) was much diminished. In mid-century, the Mamelukes seized power in Egypt.

However, it was the Mongol scourge that wreaked the greatest havoc. In 1258 A.D., Hulago, the leader of the hordes pressing in upon the Arab domains, succeeded in overrunning Baghdad. For a brief period, they even occupied Damascus. They were finally

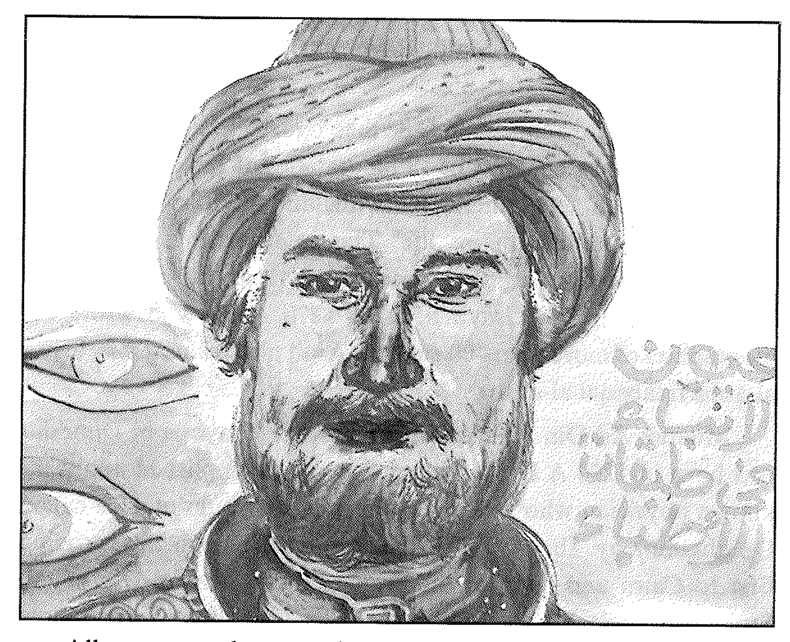
stopped by the Mameluke sultan, Kutuz. Kutuz himself was promptly assassinated immediately thereafter by his general, Baybars al-Bundukdari, who then seized power and ruled Egypt and Syria until 1277 A.D. He made Cairo and Damascus twin capitals of his realm and greatly improved the roads connecting them. Two of Baybar's sons ruled briefly after his death, and then his general, Kalawun (al-Malik al-Mansur), held power during the last years of Ibn an-Nafis's life.

Meyerhot and Schacht, in 'The theologus autodidacticus of Ibn an-Nafis', cite the contents of 18 biographies of Ibn an-Nafis, and they mention a few others. Notwithstanding this, there is no detailed information on his life. This is surprising, because he worked for a time in the same hospital as did the famous biographer, Ibn Abi Usaybi'a, [1200-1270 A.D.] who wrote the biographies of more than 400 eminent Arab physicians in his 'Uyun al-anba fi tabaqat al-attiba'.

Muafak Ad-Din Abu Al-Abbas bin Abi Usaybi'a bi Dimeshq was born in 1200 A.D. His father was an accomplished and well-known physician who was an expert in what would now be called Ophthalmology. Ibn Abi Usaybi'a emulated him in this, moving first to Cairo and later, at the urging of king Az Ad-Din of the Syrian city of Sarkhad he settled there. He is of course famous now for his book referred to above, it is an invaluable source not only of the lives of eminent medical men discussed in it but also of society at large. A puzzling absence from Uyun Al-Anba fi tabaqat al-attiba is the name of Ibn Al-Nafis. It is conjectured that the absence from this list of such an impressive a man as Ibn an-Nafis is most likely due to a personal dispute between the two men.

Ibn an-Nafis was born in or about the year 1210 A.D. in a town near Damascus (possibly Kurashiyya) and he grew up in Damascus itself. He and the physician-historian Ibn Abi Usaybi'a were both students of Muhadhdhib ad-Din Abdul Rahim ibn Ali, who was

also known as 'ad-Dakhwar', and who taught in Damascus at the hospital founded by Nur ad-Din (The an-Nuri hospital). Ad-Dakhwar later became the chief physician of Egypt and Syria, and this may partly explain Ibn an-Nafis's subsequent move from Damascus to Cairo.



All sources make note of the erudition of Ibn an-Nafis. Like ar-Razi and Ibn Sina before him, he was accomplished in many fields. According to Abdul Karim Chehade, he was considered one of the greatest savants of his century who excelled not only in medicine, but also in linguistics, philosophy, theology and law. He taught in a law school in Cairo, and he also lectured on the philosophy of Ibn Sina and on grammar. Like Ibn Sina, he was considered stronger in the theory of medicine than in its practice. However, one of the reasons for his been considered weaker in the practical aspects of medicine was his inclination to prescribe diets or simple medicines

in preference to complex medications. This is strongly reminiscent of ar-Razi (and indeed of several other great men of medicine). However, it ran counter to the preference of most of the physicians of Ibn an-Nafis's day. who seemed to hold the opinion that the efficacy of a treatment was directly proportional to the complexity of the doctor's prescription. Chehade writes, (translation) "contrary to most of his predecessors, Ibn an-Nafis was a meticulous observer who recorded facts minutely. His love of the truth and his logical spirit imposed upon him the duty to refuse to follow sacred theories blindly. He opposed the ideas of Ibn Sina and Galen when he considered them false, and he didn't hesitate to criticise boldly, something which had not been permissible heretofore".

His career in Cairo was extremely successful; he became chief of the an-Nasiri, a hospital established by the illustrious Salah ad-Din. This was an onerous and prestigious position to hold. Hospitals in the Arab world were very well organised. Seyyed Hossein Nasr describes their origin as follows: "The institution of the hospital was inherited by the Muslims from both the Persians and the Byzantines. Already, before the rise of Islam, the hospital at Jundi-Shapur, near the present Persian city of Ahnaz, was a major medical institution in which, in addition to the care of patients, medical instruction was carried out on an extensive basis. In fact, this hospital and medical school complex was the main link of transmission of Graeco-Alexandrian as well as Indian and Persian medicine to Islam."

The al-Adudi was a typical Arab hospital. It is the hospital founded by Adud ad-Dawla in the city of Baghdad. This is possibly the hospital whose site was chosen by ar-Razi who had it constructed in the place where meat took longest to putrefy. Abdul Karim Chehade has given a good description of it. As with all Arab hospitals, it was divided into two sections, one reserved for women and the second for men. There were wards for those with fevers, for

the wounded, for ophthalmological cases and so on. Hospital rooms were well aired and cool. The corridors were wide and also ventilated. Chehade notes that the prospective patient was first given an external consultation. If his illness was not severe, a treatment was prescribed using medicines from the hospital pharmacy. On the other hand, the severely ill patient was admitted to hospital immediately irrespective of that patient's sex, social class, age, colour or religion. Note would be taken of his name and he would then be bathed and given suitable clothing. He would become the responsibility of the doctor in charge of the section in which he was placed, and this doctor would visit him daily. Hospitals often had associated with them lecture halls, libraries, mosques and, of course, administrative quarters.

Even in the time of ar-Razi, hospitals had doctors at increasing levels of responsibility. If a junior doctor was unable to make a diagnosis, then a more senior one would look at the patient, and this would continue, with the patient being assessed by doctors at higher and higher levels of skill and experience until, hopefully, a diagnosis was reached. Senior doctors had as an extra duty the task of tutoring those junior to them, and this included discussion of difficult cases at the patients's bedside.

Eventually, Ibn an-Nafis became the chief physician of Egypt, and personal physician to the sultan Baybars. His wealth must have been considerable. He had built for himself in Cairo a magnificent house which was noted for its marble paving ("even its hall, and I have never seen a marble hall, save in this house" - from Safadi al-Wafi bil Wafayat).

Ibn an-Nafis died in the year 1288 A.D., after an illness of six days. He refused the advice of an attendant doctor that he take a little wine to help dislodge the illness, saying that he did not want to meet the Almighty with wine in his body.

Until the year 1924, it seemed established that **the lesser or pulmonary circulation** had first been described in the sixteenth century. Haddad and Khairallah note that Michael Servitus, Realdus Columbus, Carlo Ruini, Andreas Cesalpina and Francois Rabelais were all credited with its discovery in one way or another. However, Muhy ad-Din at-Tatawi came upon an Arabic manuscript in the German city of Berlin in 1924 which showed that **this discovery had been made more than three hundred years earlier by Ibn an-Nafis.** In One of the books written by him, 'Commentary on the anatomy of the Qanun of Ibn Sina', there are passages containing his description of the pulmonary circulation. What is said is that the blood passes from the right ventricle to the lungs via the 'vena arteriosa' to the left ventricle of the heart. Ibn an-Nafis disagreed with Galen in stating that there is no way the blood can pass directly across the septum dividing the two ventricles. He disagreed with Ibn Sina, who believed the heart to contain three ventricles, in stating that it had two. Manfred Ullmann has written a translation of some passages written by Ibn an-Nafis, which I quote in part: "blood in the right ventricle is refined so that it is prepared and ready to be mixed with the air....When the blood has been refined in this ventricle, it must reach the left ventricle where the pneuma (ar-Ruh) is formed. But between these two ventricles there is no passage because the substance of the heart here is compact (musmat). In it there is neither a visible passage, as some would suppose, nor an invisible passage which would serve to carry the blood through, as Galen thought, because the pores (masamm) of the heart are closely placed here and its substance is firm. Thus, this blood, when it has been refined, must certainly reach the lungs by the arterial vein, so that it can spread out in their substance and mix with the air, so that its finest constituents can be clarified and so that it can then reach the 'venous artery' and from there the left ventricle."

And so we see that, in the thirteenth century, Ibn an-Nafis clearly described the lesser circulation of the blood. Ullman notes that the description produced by Servetus some three hundred years later "resembles Ibn an-Nafis so strongly that one can hardly reject a direct influence". This is a strong possibility. Andreas Alpago, a Renaissance scholar and physician, spent a great deal of time and effort in translating Arabic manuscripts into Latin. He lived some 30 years in Syria. It is reported that some Latin versions of Ibn an-Nafis's 'Commentary on the anatomy of Ibn Sina' appeared in 1547.

Sadly, although Ibn an-Nafis was much respected and honoured in thirteenth century Egypt and Syria, three hundred years later, sixteenth century Europe punished Servetus for what it considered his heresies by having him burnt at the stake.

The 'second Ibn Sina' was every bit as prolific a writer as was his namesake. It is said that he was also like Ibn Sina in that he was able to write copiously over long periods of time without recourse to notes. Before he began to write, it was his habit to have made ready several pens so that his train of thought need not be interrupted by the need to sharpen his pen when it became blunt. At times, he would dictate to scribes what he wished to have written. Only fragments exist of his most ambitious piece of writing, 'The comprehensive book on the art of medicine' (Kitab ash-Shamil fis-Sina'a at-Tibiyya). Originally conceived as a work of 300 volumes, only 80 were actually finished. Meyerhof and Schacht remark that a biographical notice on Ibn an-Nafis in the Zakiriyya Library in Damascus describes this work as containing "the different schools of thought of the scholars and the various beliefs of the groups of sages in the several sciences and (systems of) philosophy, together with the substance and quintessence of their arguments and opinions, accompanied by a simple, exhaustive, efficacious and satisfactory explanation". However the extant manuscripts do not,

according to Meyerhof and Schacht, "contain anything of the kind".

It is not surprising to read that the 'second Ibn Sina' was well versed in the writings of the original. It is said that he almost knew the 'Qanun' (a work containing more than a million words) by heart. His most popular work was the 'Epitome of the Qanun'. It omitted physiology and anatomy, and was designed as a practical physician's concise but detailed resume of the 'Qanun'. Chehade notes that the last edition of this work was published in Calcutta in 1828 under the title, 'Moojiz ool Qanoon'.

Probably his 'Commentary on the anatomy of the Qanun' (Sharh tasrih al-Qanun) is his most interesting work for the modern reader, since it contains, as has been mentioned already, his original description of the pulmonary circulation. Copies of this manuscript are to be found in the museums of many cities in the world, including Damascus, Berlin, London, Paris, Patna, Leningrad and Oxford. The writings on anatomy which were dispersed through the first three books of the 'Qanun'were collected so that the subject could be given a unified treatment. According to Chehade, the work began with chapters on differentiation of animals with respect to their organs, on the importance and interest of anatomy, on the proof of the usefulness of organs and the anatomical means of studying organ function. There was a fifth chapter on anatomical technique and instruments of dissection. The work then proceeded through a discussion of the various organs and systems of the body. Ibn an-Nafis would begin each section with, "The Master says:" and he would then preface his own views on each subject by beginning, "Commentary", or "I say". When the master's views did not coincide with his own, he wrote, "this is not exact", or "this opinion is false".

Ibn an-Nafis wrote on many other aspects of medicine. He wrote a commentary on 'Questions on medicine'(Mesa'il fit-Tibb) which

had been written by Hunayn Ibn Ishaq, the renowned head of the Baghdad School of Translators who died in 873 A.D. He wrote several commentaries on the works of Hippocrates on ('Aphorisms'. on 'De natura hominis', on 'Epidemics' and on 'Prognostics'). His 'Well-arranged book on ophthalmology' (Al-Kitab al-muhadhdhab fil kuhl) is, according to Meyerhof and Schacht, " a comprehensive but not very original record of the whole knowledge of the Arabs in ophthalmology". He also wrote 'The choice of foodstuffs' (Al-mukhtar min al-aghthia) on dietetics. There is apparently no trace now of one of his works the title of which is preserved in a story told of him. He was in a public bath once and was seized halfway through his ablutions by the need to compose. He dried himself, took pen, ink and paper, and wrote from beginning to end, 'A treatise on the pulse'. He then returned to his bath.

Although his composition, 'Theologus autodidacticus' (ar-Risala al-kamiliyya fis sira an-nabawiyya) is by no means a medical treatise, it is an interesting fictional work that shows how aware men were at that time of animals and plants. Of course, it is much more than that. The author begins the tale by describing the spontaneous generation of life - in the form of a boy, Kamil, of 10 to 12 years of age - from a mixture of clays in a cave which chance had so intermingled that the individual organs and finally the boy himself came into being. He finds himself on an island and, by observation and logical considerations, he comes to a very nearly complete understanding of the fundamentals of zoology and botany. Logic alone then leads him to an appreciation of the nature of God, the Prime Mover. When his island is visited by some men, he sees how much more able a social group is to combat the forces of nature, and he further deduces that such a social group is in need of law, and that the law which is perfect is that from God. He then goes on to see the need for prophets of God to explain God's laws in increments until such time as man is prepared to accept its final and complete enunciation. The fictional narrator of

the life of Kamil, the Perfect Man, goes on to describe how Kamil saw the logical necessity for the harshness of Baybars al-Bundukdari and even the successful Mongolian attack on what had been the heartland of the Arab domains. The tale finishes with Kamil's view of earth's and man's end.

Ibn an-Nafis lived some 78 Gregorian) years. He was esteemed during his own time and, thanks to the rediscovery by Muhy ad-Din at-Tatawi of his description of the pulmonary circulation of the blood, he is similarly admired by our own age. He lived some 500 years after the beginnings of Arabic Medicine. His work is proof of its persistence and durability under the most unfavourable circumstances and a testament to its excellence.

Acknowledgement

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